Unnatural Selection -
The Social Dimension of the Health Selection Hypothesis

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Abstract

In this PhD-thesis the social context of health selection processes on the German labor market are investigated theoretically and empirically. Based on human capital theory a number of hypotheses about the causal effect of subjective health and sickness absence on job status are derived. The theory is modified to allow the effect of health to vary with the degree of disadvantage a person faces and the degree of social closure of the job. In concrete terms, the moderating effect of gender and public versus private sector are investigated, as well as the occupational gender composition. The empirical analyses are based on the Socio-economic panel study (SOEP) using different methods to estimate causal effects of subjective health on subsequent job status. A decomposition of overall health inequalities into effects attributable to time-constant, time-varying confounders and into health selection processes is presented. The results show that health selection is present for women in the private sector, but not for men nor in the public sector. Sickness absence shows the strongest effects for men in the private sector, but not for women nor in the public sector. For the chosen setting, health selection processes are strongest in open positions and for groups that are disadvantaged.

Zusammenfassung

Die vorliegende Dissertation untersucht theoretisch und empirisch gesundheitliche Selektionsprozesse auf dem deutschen Arbeitsmarkt und wie diese durch soziale Kontextfaktoren beeinflusst werden. Aufbauend auf der Humankaiptaltheorie werden eine reihe von Hypothesen aufgestellt über den kausalen Effekt der subjektiven Gesundheit und der krankheitsbedingten Fehltage auf den Jobstatus. Die Humankapitaltheorie wird so erweitert, dass der Effekt der Gesundheit mit dem Grad der Benachteiligung einer Person und dem Grad der sozialen Schließung des Jobs variieren kann. Konkret werden die moderierenden Einflüsse des Geschlechts und des öffentlichen versus privaten Sektors sowie der Geschlechteranteile im Beruf untersucht. Die empirische Analysen werden auf Basis des Sozio-oekonomischen Panels (SOEP) durchgeführt. Verschiedene Methoden werden angewandt, um kausale Effekte der subjektiven Gesundheit auf den Jobstatus zu schätzen. Weiterhin wird eine Dekomposition der gesamten gesundheitlichen Ungleichheit in zeit-konstante und zeit-variante Faktoren und auf gesundheitlicher Selektion basierende Prozesse durchgeführt. Die Ergebnisse zeigen, dass gesundheitliche Selektion für Frauen im privaten Sektor gefunden werden kann, nicht aber im öffentlichen Sektor und auch nicht für Männer. Für krankheitsbedingte Fehltage kann ein kausaler Effekt für Männer im privaten Sektor gefunden werden, nicht aber im öffentlichen Sektor oder für Frauen. Unter den gewählten Bedingungen der Studie, sind gesundheitliche Selektionsprozesse daher eher in offenen Positionen und für Gruppen, die einer Benachteiligung gegenüber stehen zu finden.

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1. Introduction

1.1. The Challenge of Health Inequalities

"Health" that is in several languages the short form of making a toast . In Italian it is "Alla Salute", in French it is "Au Santé", in Russian "sa sdorowje", in Greek "jamas". Wishing for health seems to be an important part of cultures. But it is not only when we look at traditional toasts that we get the impression that health is of central importance to modern societies. In the scientific world we see such a trend as well.

Recently, traditional measures of welfare like the GDP are gradually replaced and complemented by more comprehensive measures of welfare. All of these indicators include at least one form of measuring public health in a society.

The so called Stieglitz-Sen-Fitoussi commission[1] proposed that one essential dimension of well-being is health. Similarly, the enquete commission of the German Bundestag proposed health as one important dimension of measuring prosperity. They suggest that life expectancy and especially healthy years of life are an adequate and important measure for the prosperity of a country[2].

Health disparities are a form of inequality which faces one of the lowest acceptance rates in society (Blacksher, Rigby & Espey 2010). Most governments have therefore, in one form or another, pledged to reduce health inequalities. This includes traditionally social-democratic welfare states like Sweden (Socialstyrelsen 2010), conservative welfare states likes Germany (BMAS 2013) and liberal welfare states like the US (HHS 2011) and the UK (Smith 2000). The EU also has a strategy for reducing health inequalities (EPEH 2007). It is fascinating that although there seems to be universal agreement to abolish health inequalities, they still persist for decades throughout continents and throughout different welfare regimes. This puzzle has kept scientists busy for some time now, resulting in several theories which try to explain this phenomenon. So far, no general conclusion has been reached (Mackenbach 2012).

The goals of various OECD-countries therefore imply, that health is supposed to be universally enjoyed regardless of social position. Abolishing health inequalities would thus mean that social position does not correspond with health status. This normative approach to public health can be supplemented by a more instrumental understanding of the role health and health

[1] The "Report by the Commission on the Measurement of Economic Performance and Social Progress" (Stiglitz, Sen & Fitoussi 2009).

[2] For the report see Bundestag (2011).

inequalities play. We can arrive at this understanding if we ask the following questions. Is health only an end in itself? Something that is valued for its own sake? Or is it also a means to achieve other things in life? Do individuals use their health strategically to get into certain social positions? Does such a strategic use lead to selection of the healthy from the unhealthy in favorable positions? Are health inequalities affected by such selection processes? If such a selection process existed, this would mean that we would observe differences in health status between social positions, because those in good health get into good positions while those in poor health only get into low positions. And if health inequalities are generated in such a fashion, does this explain all health inequalities, or do inequalities remain after we take selective processes into account? Would such a health selective mechanism convert understanding of health inequalities? Would this lead us to the conclusion that these inequalities are natural inequalities a society has to live with? Can health selection reduce health inequalities to the realm of biological processes?
These are the questions, which inspired this thesis. The role of health selection in the generation of health inequalities is investigated theoretically and exemplified with an analysis of health inequalities and selective processes between jobs of high and normal status.

Health inequalities present a fundamental challenge to societies that are built on equality and guaranteed human rights. Is it justified that those who are poor die several years earlier than those who are well off? I will not answer this question, because a normative discussion of such matters is not conducive for the purpose of the study. However, I do strongly believe that a discussion of such questions is important. The answer to the question whether these inequalities are justified or not, could be contingent on how these inequalities actually come into existence. My thesis makes a small contribution to the discussion about mechanisms of production and reproduction of health inequalities.
Health inequalities have corollaries for the live of individuals beyond the sphere of physical health. We will see in my theoretical discussion, that impaired health will reduce chances in the competition for important resources like educational credentials or jobs. Health is not only a fundamental indicator for social inequalities, but it is also an unequally distributed resource which leads to varying chances in different social spheres. This makes health inequalities a form of structural inequality. The ramifications of health inequalities go further than those of other forms of inequality, which are often juxtaposed to health inequalities, like social inequalities in happiness, or life satisfaction.
Following the logic of Bourdieu (2012) health as a resource or capital (Grossman 1972) certainly has influence on many parts of an individual's life. One important aspect of today's life is particularly subject to the consequences of an individual's health. This is the labor market and all the rewards an individual can gain there. For example, if wages are paid according to productivity, and sick workers are less productive, they will have smaller paychecks than healthy workers. This is the health selection hypothesis for the labor market in a nutshell.

For high status jobs it can be argued that you need to show excellent performance to beat your competitors for the position. If your health is impaired, you face significantly worse odds in such a competition. From a population perspective, part of the health inequalities between incumbents of high status jobs and incumbents of regular jobs might stem from the fact that these highly desirable social positions go to those persons who are healthy and not to those who are sick. This is an example of the health selection hypothesis and the proposed mechanisms applied to a certain aspect of the labor market. While the argument seems convincing, in a wide range of literature of public health research it has received scant to no attention. If health selection was discussed it was deemed negligible (for some of the studies which shed a critical light on health selection, see e.g. Blane 1985, Bartley 1988, Smith, Bartley & Blane 1990, Blane, Smith & Bartley 1993, Bartley & Plewis 1997, Blane, Harding & Rosato 1999, Chandola, Bartley, Sacker, Jenkinson & Marmot 2003, Claussen, Smits, Naess & Davey Smith 2005, McMunn, Bartley, Hardy & Kuh 2006, Bartley, Ferrie & Montgomery 2006). During this thesis it will become clear that the neglect of health selection in the analysis of health inequalities is an aberration. I assert that we will find instances where persons are selected according to their health and we will find cases where health plays only a minor role in determining societal outcomes. What we lack is a guiding theory which tells us where to look for health selection. I try to make a first step to close this gap. I exemplify the potential of my approach with the analysis of the influence of health on job status on the German labor market. The results show that under some circumstances health is a valuable asset. It is a characteristic on which workers are sometimes, but not always, selected.

The thesis is guided by the following research questions.

A) Through what mechanisms does health selection influence health inequalities in society? Are these mechanisms natural or social processes? My argument is that theoretical work so far has approached the health selection hypothesis only in a superficial way. A more detailed and explicit theory, which accounts for variation in health selection processes due to social context can be a remedy to this situation. I use the word "theory" for simplicity's sake. In this context it means that I develop a set of assumptions. From these assumptions I derive expectations about the social world, which coalesce with most of the predictions commonly subsumed under the health selection hypothesis. I do not claim to develop a grand theory. If anything, it is rather a middle-range theory (Merton 1968).

B) I follow up with several empirical question that put the theory to the test. These are:

   1) Does subjective health influence job status?

   2) Does this selective process vary with social context?

   3) How do gender and competition moderate the health selection process?

   The generalized hypotheses I develop in my theoretical part are:

1) Better health increases the chance of attaining or keeping a high status job.
2) Health influences job status stronger for women than for men.
3) The higher the competition on the labor market, the stronger the impact of health is on job status.

1.2. Scientific Contributions

While investigating a central aspect of inequality in contemporary societies, this thesis makes several important scientific contributions to the existing literature.

First of all, it provides the first comprehensive approach to a theory of contextualized health selection. Such a theory allows to bridge the theoretical gap between advocates and opponents of the health selection thesis. This includes a bridge between the research fields of public health and health economics. Health economists often use the health selection hypothesis implicitly, without calling it health selection. Studies from the field of public health on the other hand often dismiss health selection outright.

Beyond the bridging function, my theory of health selection highlights the societal relevance of health selection. It describes how it influences the social position of the individual and how in turn health selection is influenced by social context. Further, the theory allows the identification of key conditions that are necessary for health selection or which increase or decrease the likelihood of health selection processes. In addition, the theory facilitates the derivation of empirically testable hypotheses about the existence or absence of health selection processes on the labor market and beyond.

Second, there are several methodological innovations in my thesis: The measurement of subjective health as a latent variable based on self-reported health indicators has not been done so far. This measurement procedure is a very close approximation of the methodological theory of what construct should actually be measured and is therefore a judicious alternative to existing measures. A latent variable approach has the innate feature of offering empirical criteria, which allow me to decide whether subjective health can be plausibly compared between social groups in my data set.

I also use a fixed-effects approach with a cross-lagged panel model, combining two strengths of methods used in public health and health economics. This combination allows me to control for time constant unobserved factors and to test both paths of causality in one model: Health influencing job status (health selection) versus job status influencing health (social causation). Further, I discuss a common approach to the decomposition of health inequalities and prove that it is inadequate for its intention. An improved method based on path analysis is presented and used in this thesis. Path analysis is also used to develop a method for decomposing health inequalities into time constant and time varying parts including measures of uncertainty for this decomposition. To the best of my knowledge, this constitutes a methodological approach,

which has not been developed or used so far.
Third, I contribute to the empirical literature on health selection. For Germany there are only a few studies which deal with this problem. In the analyses I focus on job status, a labor market outcome, which has only rarely been studied with regard to health selection. In addition, I conduct systematic sub-analyses according to the degree of social closure of positions on the labor market highlighting the importance of social context. And I make a systematic differentiation between health problems that are directly visible to employers and those who are not and compare respective results.
Developing a first theoretical approach to health selection, using and developing interdisciplinary, advanced methods, and providing empirical evidence on health selection in understudied labor market contexts, my thesis thus makes important contributions to the recent scientific literature on health inequalities and labor market research.

1.3. Structure of the Thesis

The thesis is structured as follows.

The second chapter develops a theory of health selection. At the beginning, health inequalities are defined and their link to health selection is discussed. A review of the theoretical work in the scientific literature follows. The literature is summarized and deficiencies are highlighted. In a next step, I present and de-construct the often dismissive argument that health selection cannot contribute anything substantial in explaining health inequalities. My argument is that health selection is not a form of natural but unnatural selection in the sense that it is social in nature and its mechanisms are susceptible to change through social context.
I make an attempt at building a theory of health selection. Using a modified version of human capital theory, I can show how health might become a selective factor with regard to labor market success. The main actors in a health selection process are the employer and the employee. Effort links health to labor market rewards. Furthermore, I introduce a distinction between actual and perceived effort and argue that women face a disadvantage with regard to perceived effort. This leads to a differentiation of health selection theory for men and women, stating that health should be more important for women than for men with regard to their labor market success. Alternatively, I suggest that men do not adjust their effort at work to the same degree as women do. This leads to the hypothesis that health is a selective factor for women, but not for men.
In addition to the gender dimension of the theory, I look at the context which facilitates or hinders health selection. The main argument is derived from the implicit assumption of a competitive market situation, which lies at the heart of human capital theory. This leads to the hypothesis that health selection only occurs if there is competition for jobs.
While a competitive situation is one of the main assumptions of human capital theory, sociological labor market research has argued for decades that there are substantial parts of the

labor market that do not follow market mechanisms and where job competition is low. The most refined theory which allows me to make such distinctions is the theory of open and closed positions. Drawing on the theory of open and closed positions, I propose that in labor market positions with a high degree of closure health is not a selective factor. In positions with a low degree of closure the health selection mechanisms work as described in my modified human capital model. The integration of sociological labor market theories corroborates the impact of social context on health selection mechanisms.
In the end of the theory chapter, I summarize my theoretical argument, list the set of assumptions on which it rests, and propose a series of hypotheses to test the theory.

The third chapter gives an overview of the studies which already dealt with the health selection hypothesis. I group the studies according to various characteristics and develop criteria for "good practice" in empirical studies. I present the studies, which fulfill the "good practice" criteria in detail to show differences and similarities in their study design compared to my study.

Chapter four explains my methodological approach to the identification of health selection effects on the German labor market. Health is defined in the first part of the chapter. I propose a latent variable approach which allows to address the question of comparability of subjective health items between men and women on an empirical basis. The question of causality is addressed in a separate section. I explain in what sense my thesis can provide evidence for causal relationships. Subsequently, the statistical approaches for this thesis are presented. This includes a brief discussion of survival analysis, fixed-effects logistic regression, and cross-lagged panel models with fixed-effects, as used in my thesis. I also describe an improved approach for decomposing health inequalities into different factors, including time constant and time varying factors. Finally, I present the data set and discuss the empirical measures of the various constructs from the theory.

In the fifth chapter, I discuss the results of my analysis. I begin with basic descriptives of health inequalities. All analyses are done separately for men and women, and separately for public and private sector, yielding four basic groups of analysis. The estimation of the effect of health on job status is based on fixed-effects logistic regression. Afterwards, the effect is allowed to vary according to the degree of occupational closure.
In the next step I use survival analysis to differentiate whether a person wants to acquire a high status job or whether the person already occupies such a position. This exemplifies how the individual position interacts with health selective mechanisms.
I use cross-lagged panel fixed-effects models to test for reversed causality and to assess both health selection versus social causation in one model. The model controls for time constant unobserved factors making a causal interpretation of the results more plausible. The last part of

the analysis decomposes the observed health inequalities into social causation, health selection, and third factors. It also compares the strength of the health effect to other covariates. This allows an assessment of the importance of health selection in generating health inequalities. The last part of the chapter summarizes the results with a focus on the main research questions and hypotheses from the theory.

The sixth chapter concludes. A focus will be put on a generalization of the health selection model to non-labor market situations. In addition to suggestions for further research I call for a serious theoretical and empirical treatment of health selection as one relevant factor which contributes to the explanation of health inequalities.

2. Theory

As explained in the introduction my thesis has more than one point of focus. The most abstract level will deal with the question whether health selection processes should be viewed as just a nuisance in the analysis of health inequalities or if they should play a separate role as one mechanism among others in explaining health inequalities.
Then I will address the question under which circumstances we should look for health selection processes. The area which I will apply my theoretical discussion to, will be the labor market in Germany, and high status jobs in particular. On this concrete third level I will investigate to what degree health can have different effects on labor market rewards for men and women and under different degrees of competitiveness of the labor market. This is where the empirical analysis comes into play. Based on the example of the German labor market the conditions for health selection will be assessed both theoretically and empirically. The fact that context matters for health selection processes underlines that it is not a negligible or natural process. It is *unnatural selection* in the sense of being directly influenced and shaped by social actors and structures. Its relevance is to be determined empirically. Therefore it should find a place in every discussion of health inequalities.

To be more specific my theoretical part will deal with the following points:

1. Defining conditions under which health selection mechanisms can be expected to contribute to health inequalities using a classical human capital approach to explain health selection.

2. Explaining gender differences in health effects on job status through two complementary approaches:

   a) women's structural disadvantages on the labor market, which focuses on the role of the employer.

   b) gender differences in preferences for health and career, which focuses on the role of the employee.

3. Using the theory of open and closed positions to explain the absence of health effects in some parts of the labor market.

4. Modifying the theory of open and closed positions to explain different health effects for incumbents and applicants.

5. Deriving hypotheses from the set of theoretical assumptions that can be empirically tested.

The chapter is organized as follows. First, I will define health and health inequalities and its three major explanations: *social causation*, *health selection*, and spurious correlation (section 2.3). I review the literature on health selection with regard to theoretical contributions showing that most of the literature lacks an explicit theory of health selection. I then argue that health selection has to move from a hypothesis to a theory to fully appreciate its contribution and assess its limitations in explaining health inequalities.
Second, I use an economic model of effort and labor market rewards - as proposed by Gary Becker (1985) - and introduce health as an exogenous factor influencing effort (section 2.4). I develop the concept of *perceived* instead of actual effort as a determinant of labor market rewards and argue that employers' perception of effort is biased against women. Several complementary theories justifying the assumption of this bias are proposed (sections 2.5.1 & 2.5.2). In conclusion this leads to the hypothesis that - with regard to labor market rewards - health is more important for women than for men. As a complementary explanation I use gender differences in employees' preferences for health and career which also leads to the conclusion that health has a stronger effect for women than for men (section 2.6.1).
Third, I will point out that there might be differences in the effect of health problems with regard to the visibility to the employer. I discuss how this matters for health selection and how it can be tested empirically (section 2.5.4). Fourth, I draw on the notion of open and closed positions (section 2.7). Following the argument that performance and rewards are not related to each other in closed positions I conclude that health effects on labor market rewards should only be found in open positions (section 2.8).
However, fifth, I argue that a modification of the theory of open and closed positions is necessary. Health effects in open and closed positions are different for incumbents than for applicants (section 2.8.1.2). The role of disadvantaged groups in modifying the degree of closure of a position is discussed with implications for gender differences.
At the end of the chapter I sum up the argument, list explicitly all assumptions which my theory relies on, and derive a number of hypotheses which I will test in my empirical part.

2.1. Health Selection and Health Inequalities

When discussing health selection and its contribution to health inequalities it is helpful to first define health inequalities. I will discuss the concept of health inequalities and how the contribution of health selection to health inequalities is seen in the literature. Then, I will make the case for a better standing of health selection within the scientific debate of health inequalities.

2.1.1. Defining Health Inequalities

The term health inequalities is usually used if social inequalities are related to health or illness (Richter & Hurrelmann 2009, 11). This means that not all differences in health are called inequalities, but only if they relate to socio-economic inequalities and are therefore in a sense avoidable (Bommier & Stecklov 2002, 502).
Generally speaking, health inequalities can be explained by three major mechanisms. First, there is social causation. This view claims that social circumstances influence health. Second, there is health selection, which claims that health influences the social position of an individual. Third, there are common background factors that might lead to spurious correlation. In this case it is assumed that some (possibly unknown or unmeasured) factors influence both the social position and health (Goldman 2001, 10068), but that they are in fact not causally related.

2.1.2. Defining Health

Before I go into detail on theoretical models explaining health inequalities I want to state the definition of health which underlies all my theoretical arguments. My definition of health needs to satisfy three conditions.

1. It needs to make a link to performance on the labor market plausible.
2. It must be measured in a large scale longitudinal survey that also has detailed information about the household context and job characteristics
3. It must at least partly be comparable to definitions of health in previous research to allow an evaluation of the results within the wider context of the literature.

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The well-known World Health Organization definition (WHO 1946) of health is

> "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

I will stick to this definition which is sometimes labeled the *social model* of health in contrast to the *medical model* of health (Townsend & Davidson 1982, 42). As this definition has a holistic approach to health, I choose to let every person evaluate for themselves how good or bad their health is. This has the disadvantage that sometimes the same health conditions might lead to different responses on a subjective health item. However, the advantage is that this approach covers all aspects of health. Most of the theory developed in this chapter is not specific to certain diseases or limitations. Theories specializing on certain health conditions are very useful, but are beyond the more general approach, which I adopt. For now the purpose of the thesis is best served by this broad definition.

2.1.3. Social Causation

I now turn to the two hypotheses which postulate a causal link between social conditions and health. I start with social causation. This section will offer only a very brief introduction into the logic of social causation in general. Some theoretical ideas on how job status in particular and health might be linked by the logic of social causation are stated as well. I do not claim that the discussion presented here is exhaustive. Far from it, it is a reminder of what is the dominant way of explaining health inequalities in the literature. The main focus of the thesis is on a discussion of the health selection hypothesis within social context. It would go way beyond the scope of the thesis to give a full account of health selection and social causation for the matter at hand. The relatively short section on social causation does not mean however that it is less important or theoretically less developed than the health selection theory. The opposite is true. I focus on health selection, because theoretical and empirical work on this hypothesis lags behind in comparison to the social causation approach. The relative neglect of social causation is the price I have to pay for the extended discussion of health selection. It should be noted, however, that although the empirical analyses also focus on health selection they include tests of both causal pathways.

Usually health inequalities are explained by disadvantages certain groups suffer in relation to other groups. The theory states that these disadvantages (directly or indirectly) impair the health of members of that group. Therefore general health status is worse in the disadvantaged group. The mechanisms might vary by context and application, the logic is always the same. Ever since the Black Report (Townsend & Davidson 1982) this logic has dominated health inequalities research, at least in the field of medical sociology and epidemiology (Smith 1999, Goldman 2001). I will refer to this argument in general as *social causation*.

The mechanisms of how social group membership can influence health are very diverse. I mention the most important ones (compare e.g. Richter & Hurrelmann 2009).
First, there is material deprivation. Some persons cannot get enough (healthy) nutrition, clean water or have no access to health care and medical treatment, because they cannot afford these things. This will have negative health consequences and create health inequalities in comparison to persons who can afford it. This kind of health inequality is mostly associated with disparities in household income (Marmot 2005, 1101).
Second, there are environmental factors (Borg & Kristensen 2000). Air pollution, environmental hazards, occupational injuries, physical or psychological strain at work or at home might severely endanger a person's health. Some economic theorists argue that such dangers should be compensated by increased wages or reduced rents (Cousineau, Lacroix & Girard 1992, Leeth & Ruser 2003, Viscusi & Moore 1987). Nevertheless, there will be health disparities between those exposed to such risks and those who are not. An important factor is the interaction with

health knowledge, because the risk of exposure might not always be adequately assessed by the individual. As these risks are not randomly distributed within society, some groups are more exposed to such risks than others (Hoven & Siegrist 2013, Wahrendorf, Blane, Bartley, Dragano & Siegrist 2013).
Third, health behavior strongly influences health and can create health inequalities. Some social groups smoke more often, visit general practioners less often, eat rather unhealthy, etc. Preventive health measures can lead to lower prevalences of (serious) illnesses over the life course. Healthy diet can increase life expectancy or reduce chance of getting diseases like diabetes or strokes. Exercise and physical activity also contribute to health inequalities between different social groups. These difference in health behavior are again strongly associated with income and education (Cockerham 2005, Kenkel 1991, Tunistra, Groothoff, van den Heuvel & Post 1998, Wickrama, Conger, Wallace & Elder 1999, Richter, Moor & Lenthe 2012).
Fourth, there are social-psychological mechanisms like relative deprivation, inequality, or straining life events which can have a negative impact on (mental) health. The argument is that mental but also physical health can be influenced by psychological processes. Feelings of inferiority, lack of control, loss or isolation play an important role in explaining prevalence of various mental illnesses or coping behavior with existing other diseases. The psycho-social strain depends strongly on the social position, social networks, work, and family of the individual, generating structural, not random differences in health outcomes (Siegrist & Marmot 2004, Schneiderman, Ironson & Siegel 2005, Schwartz, Friedman, Tucker, Tomlinson-Keasey, Wingard & Criqui 1995, Levenstein, Smith & Kaplan 2001, Lynch, Kaplan & Salonen 1997, Lynch, Smith, Kaplan & House 2000).

For the example of job status and health there are also some arguments that can claim a causal connection in the sense of social causation. Health inequalities between high and low job status can be linked to these approaches in several ways. There might be indirect links, or spurious correlations, because persons in high status jobs are more often well educated, and might share certain personal characteristics which are beneficial to occupational success and health. In addition, there is a resource advantage of incumbents of high status jobs with regard to e.g. wages which can lead to health inequalities. Non-pecuniary rewards might also be relatively higher, and working conditions could be less noisy, dirty, or physical straining as soon as supervision or highly specialized tasks are assumed in high status.
There are actually only a few empirical studies on this exact issue. However, a phenomenon related to job status is promotion. For promotions, Anderson & Marmot (2012) demonstrate that a promotion among English white collar workers is followed by a substantial reduction of risk of heart disease. Chandola et al. (2003) can show that an increase in employment grade among UK white collar workers reduces risk of negative health conditions. This shows that job status can clearly be interpreted as a social factor which influences health through possibly material, but mostly environmental-psychological factors. Although social causation is not

the main focus of this thesis, these results and ideas clearly require that social causation is accounted for in any analyses of health inequalities. Therefore, the empirical part will allow the existing health inequalities to be explained by the classical social causation approach as well. This allows contrasting the social causation approach with the reexamination of the health selection hypothesis.

2.1.4. Health Selection

The second way to explain health inequalities I call *health selection*[1] (see e.g. Warren 2009). Persons in good health can replace persons with less good health (and related characteristics) in their social positions. This allows for social upward mobility of healthy persons and social downward mobility of persons with impaired health. Aggregated this can lead to a higher level of persons with impaired health in groups with lower social status (Bartley & Plewis 1997, 376). The process of health selection is iterative and cumulative over the life course, although there are certainly critical junctures in life that are of particular importance. Health selection can also work indirectly through risky or unhealthy attitudes, behavior and lifestyles (Virtanen, Vahtera, Kivimäki, Pentti & Ferrie 2002, 697). In this thesis I consider only direct selection.

In spite of the fact that there is a good theoretical foundation to support the health selection thesis, different health researchers deem the actual contribution of health selection processes to overall health inequalities within societies as rather small (e.g Richter & Hurrelmann 2009, Townsend & Davidson 1982, Warren 2009). Actually a lot of introductory or overview readings on health inequalities hardly mention health selection. If they mention health selection it is usually stated that research has shown that it is negligible at least in comparison to social causation (Smith 2003, Graham 2009, Dowler & Spencer 2007). The editors of the collection of Richter & Hurrelmann (2009) state with due scientific caution that they do not want to claim that health selection does not exist, but that their current volume is focused on social causation. From their perspective this is legitimate, because research has shown that health selection can make only a minor contribution to the explanation of health inequalities. Two articles in the collection discuss the health selection thesis, but still rate it as clearly inferior in explanatory power than the social causation approach (Jungbauer-Gans, Gross, Richter & Hurrelmann 2009, Dragano & Siegrist 2009).
In the collection of Bauer, Bittlingmayer & Richter (2008) one article explicitly deals with the health selection thesis for the case of inequality in health between married and unmarried persons. Unger (2008) claims in the article that for Germany the health gap between married and unmarried persons can almost entirely be explained by better prior health status, strongly supporting the health selection hypothesis.

[1] In other contexts this is referred to as *drift* hypothesis (Goldberg & Morrison 1963) or *natural* and *social selection* (Townsend & Davidson 1982). The same concept stands behind these different terms.

The collection of Wendt & Wolf (2006) does not discuss the health selection approach as one of the possible approaches in the sociology of health. Blane, Smith & Bartley (1993) point to the idea that *indirect* selection, which means that health and social class are affected at the same time by third group variables such as education, is more promising in explaining health inequalities. It is interesting that they still refer to it as indirect selection and not simply as spurious correlation. A lot of studies claiming that health selection has been shown to be of lesser importance interstingly point to studies by British scholars around the trio of Mel Bartley, David Blane, and Davey Smith (for some of their work which sheds a critical light on health selection, see e.g. Blane 1985, Bartley 1988, Smith, Bartley & Blane 1990, Blane, Smith & Bartley 1993, Bartley & Plewis 1997, Blane, Harding & Rosato 1999, Chandola et al. 2003, Claussen et al. 2005, McMunn et al. 2006, Bartley, Ferrie & Montgomery 2006). While the quality of their work is beyond question, and their scientific renown well deserved it seems that a more differentiated view and approach to the subject is possible.
More than twenty years ago, West (1991) already criticized this stark opposition to the health selection thesis and claimed that both theoretical and methodological inaccuracy and misunderstandings of the selection hypothesis might have biased such results.

Another issue might be that health sociologists, epidemiologists, medical sociologists, and scholars of public health are concerned that the attention should be focused on processes of social causation, because these processes imply greater challenges for social and health policy. This approach seems to be implicitly taken by a lot of scholars as a citation from a study for the UK EU-presidency shows:

> "The unspoken assumption in debates about the role of selection versus causation often was, that social selection is less of a problem for public policy than social causation. This assumption was incorrect, however, because limiting the social consequences of health problems is one of the classical objectives of social security and public health policies in many European countries." (Mackenbach 2006, 31)

The author of the study still maintains, however, that health selection contributes far less to the explanation of health inequalities than social causation.

2.2. Who Does all the Selection? In Search for Theory in the Literature

2.2.1. What Should We Look for?

So far we have seen that health selection as a mechanism for generating health inequalities is doubted to carry much importance. In this part, I will review the theoretical work which has

been done so far on the health selection hypothesis. There has been no systematic attempt to address the issue of moving from a hypothesis to a theory. Unsurprisingly, we will see that the theoretical work is very fragmented. Some studies contribute some substantial insights that will be picked up in the theory development in this thesis. Other studies make minor theoretical points which are also interesting. Most studies however, have a complete lack of theory. They usually just state two things:

1. There is a health selection hypothesis that proposes reversed causality for the common explanation of health inequalities.
2. Health inequalities arise, because individuals in poor health are selected into unfavorable social positions.

They make no mention of **who** selects the selected and **why**: It is also unclear according to what criteria they are chosen and under which circumstances this happens. The reason is surely, that those studies do not aim at theory building. They want to make a contribution to the empirical literature on health inequalities. As empirical analyses have trumped theoretical discussion so far, I think that a more systematic approach to theory building in this thesis is warranted.

This section is not meant to systematically build a theory on already developed theoretical approaches in the literature, because the theoretical ideas are too fragmented for such an approach. While reading the studies I was looking for an answer to the following questions:

- Which actors are involved in the selection process? Especially, who selects and why?
- Under what circumstances or in what context does health selection occur?
- Is health selection a social process?
- What are the mechanisms linking health status to unfavorable social position?

2.2.2. Studies with Theoretical Contributions

McLeod & Pavalko (2008, 77) define health selection, as it is commonly used in the literature:

> "The most common conceptualization of selection effects is as the influence of physical and mental health on the statuses and attainments of individuals, or what we refer to as reverse causation."

Some studies just very briefly make statements about the relation between social position or labor market outcomes and health. Examples are: Haan & Myck (2009, 1116) simply state that poor health reduces productivity. Haas (2006, 340) hypothesizes that a drift downward in SES through poor health works via lower labor market participation and reduced wages. Cai &

Kalb (2006, 242) state that poor health reduces productivity and employment chances given the same wage.

Naming actors involved in the process is key to understanding the mechanisms behind health selection and attempting to formulate a theory of health selection. This approach allows to model individuals with capacity for self management within certain constraints, and to make predictions about their behavior and outcomes given certain circumstances. In a slightly different context, Pavalko, Gong & Long (2007, 354) write:

> "If we view individuals as actively managing and negotiating role demands within structural constraints, these selection processes become critical for understanding the relationships among work, family, and health."

Two studies which deal with health selection and permanent versus temporary jobs shed a little light on theoretical mechanisms lying behind the health selection hypotheses.
Wagenaar, Kompier, Houtman, van den Bossche & Taris (2012, 1192) specify which actors are involved in the selection process. When making decisions about downsizing **employers** dismiss those with most health problems. In addition, they state that healthy individuals are more often hired into permanent employment, enjoying all its benefits (e.g. job security, higher wages). So, one relevant actor is the employer.
A differentiation within the labor market between core and periphery is made in the study of Virtanen, Janlert & Hammarström (2012). They state that finding a permanent job is hindered by poor health. Poor health also increases the chances of being dismissed during periods of downsizing. Most importantly, the authors acknowledge that legislation, rules and labor market structure play a mediating role in the effect of health on permanent job attainment. The mechanisms of health selection will vary with context.
This a generalization of the argument made decades ago by Perrott & Sydenstricker (1935). They argue that increased competition is associated with a reduced likelihood to be successful on the labor market when health condition is poor. For unemployment the argument is picked up by Bartley (1988) suggesting that health selection into unemployment is more important in times of high overall unemployment. This important insight will be picked up later where it is framed within a broader sociological theory (see section 2.7).

Paul & Moser (2009, 268) point out that mental health is likely to influence the job search in two ways. First, psychological problems might lead to less effort and efficiency in the job search process. Second, distress caused by poor state of mental health on part of the job seeker might negatively influence the employer's decision to hire the applicant.

McLeod & Pavalko (2008, 80) agree with other studies that job search is harder if health is impaired. Deterioration of health when already on the job might lead to reduced productivity, implicitly leading to dismissal, or reduction in compensation or status.

Mastekaasa (1996, 191) uses an economic approach to explain health selection. He presents the most systematic discussion of health selection mechanisms. My theoretical argument will resemble his in several regards, as we will see in the next chapter. Mastekaasa (1996, 191) names the employer as the main actor, making decisions about dismissing employees. These decisions are made within certain legal and social constraints.

> "However, both legal and social factors limit employers' freedom of action. [...] [...],only two actors are generally involved, i.e. a job applicant and an employer." (Mastekaasa 1996, 192)

The second important actor is therefore identified as the **employee**. The author assumes a rational profit maximizing behavior of employers resulting in a lay off of the least productive workers (Mastekaasa 1996, 191). He states that both sickness absence and reduced effort-per-hour are results of impaired mental and physical health. Therefore health becomes an important factor in the decision which employees to keep and which to dismiss. If precedence is given to seniority over productivity when choosing which employees to keep, mental and physical health should play only a minor role for the employer. One example the author give when this might be the case is if unions have a stronger influence on the process of downsizing (Mastekaasa 1996, 192). Overall the information available about the employees' productivity are key for health selection processes.

> "Generally, the union policy is to give as much weight to the seniority criterion as possible, and to resist attempts by the employer to use productivity criteria. To the extent that such union policies prevail, mental or physical health will have no impact on the probability of job loss." (Mastekaasa 1996, 192)

Less healthy employees will have a harder time convincing employers that they are productive. In addition, they will most often have more days of sickness absence, which are objectively measurable and visible to the employer (Mastekaasa 1996, 192).

Cardano, Costa & Demaria (2004, 1564) argue strongly that health selection processes are embedded in social context and are of social not biological nature. Selection processes are closely related to certain forms of discrimination or social closure. The conscious and unconscious decisions of real actors under certain constraints should be taken into account. I interpret this as a call for a rigorous sociological analysis of health selection. It is worth citing a longer passage from their study. Together with the theoretical work of Mastekaasa (1996), their theoretical idea of a truly unnatural selection process is the most important building block in the struggle to fully integrate health selection and social causation as social explanations of health inequalities for future research:

> "The selection hypothesis has usually been interpreted - not always without justification - as embodying an ideological attempt to deny the ethical and political

> importance of social inequalities in health [...]. For if it is individuals' health which determines their social position, differences in the health status of the various classes cannot be seen as unjust, or rather cannot be seen as socially unjust, for the root cause is a cynical "lottery of nature", which gives some people sound and others poor health. This has led to the idea that the hypothesis which sees flows of social mobility as being affected by health is a form of "social Darwinism" (West, 1991), which portrays inequalities in health as part of a biological selection of the fittest for the posts of higher social responsibility." (Cardano, Costa & Demaria 2004, 1564)

The most important and most cited discussion of the health selection theory comes from West (1991). He analyzes the discussion on health selection in public health, epidemiology, and medical sociology since the publication of the "Black-Report" (Townsend & Davidson 1982). He states that health selection is portrayed as an asocial theory which "[...] appears merely to vindicate capitalist values" (West 1991, 373). He points out that health selection could be seen as a form of discrimination. In his view defining the actual mechanisms and actors involved in such a process of health related selection appears to be a difficult, but important task. In his words health selection can be conceptualized:

> "not as inevitable outcomes of the properties of individuals, but as the result of the focused attention of social agencies and institutions engaged in the business of controlling entry into and movement within occupational opportunity structures." (West 1991, 374).

West (1991, 374) also speaks against the attribute of *natural* with respect to health selection. He proposes health-related mobility as a more useful term. West (1991, 379) identifies one important argument of those scholars trying to dismiss health selection in the analysis of health inequalities. This is the argument that health inequalities between classes are by far too great that health selection could play a major role in explaining them.
In my view, making a general statement that health selection cannot explain the great class differences encountered in health and mortality makes as much sense as stating that social-psychological factors on their own (as part of the social causation approach) are not enough to explain health inequalities completely and should therefore not be considered. Or stating that health behavioral factors might not be enough. Of course, no one approach is enough to explain health inequalities completely. It is a very complex construct influenced by many factors. Therefore, a comprehensive approach including all feasible explanation should be used. And of course the context needs to be considered. It is very unlikely that all forms of health inequalities related to any kind of measure of social inequality for all social groups is determined by the same causal factors. The literature has shown abundantly in the last decades that under different circumstances for different groups of individuals different parts of the social causation approach have varying degrees of explanatory power. The same will

be true for health selection. In some circumstances it will not play a role, in other cases it might be a major factor, or one factor among many. And what if it can "only" explain 10% of health inequalities in some cases. Is that not worth mentioning as well? It should also be noted that health selection might decrease health inequalities in some cases. Thus, not taking health selection into account might lead to an understatement of health inequalities generated by processes of social causation. So we can see that this argument is rightly refuted by West (1991). His exact words after reporting the argument from the literature are: "[...], as if this was enough in itself to win the argument" (West 1991, 379). This marks the point that the critics of health selection tried to win an argument where there should be nothing to win.

West (1991, 380) fiercely argues in favor of contextualizing health selection and seeing it as a social process, same as Cardano, Costa & Demaria (2004) do in their study. He states that social agents, bound by social constraints and norms, interpret health related attributes of other individuals and give them a meaning that can lead to a selection of the ill from the healthy. Health selection does not adhere to a simple cause-effect logic, but is necessarily mediated by social processes. If values or norms were to change and different meaning would be attributed to health related characteristics, health selection might work differently, or might not be an issue at all.

> "In a fundamental sense, health selection–direct and indirect–does not occur in a social vacuum; it is the outcome of an interaction between more or less valued attributes of individuals and the opportunity structures and the institutions and social agencies which control access to and processes within them" (West 1991, 380)

In my view it seems a little paradox that critics of the health selection hypothesis would argue it is Social Darwinist, asocial or perpetuating capitalist values. At the same time, they do not seem to realize that health selection only becomes natural if one accepts these ways of thinking, of making arguments, and of legitimizing inequalities as the natural order of human life. Only those who accept those capitalist values in an ahistoric fashion as natural laws could see health selection as natural selection. These values and norms are subject to change and so are the results of health related selection processes. This makes health inequalities caused by health selection a social phenomenon changeable and accessible to changes in culture or policies. For empirical research this informs us that there will be differences in the degree of health selection between and within societies (West 1991, 383).

Summing up, we can say that only very few studies name the main actors of health selection, which are employers and employees. Selection is sometimes done by the employer and sometimes as self-selection by the employee. Only one study makes this and the selection criteria in the process explicit. A few studies give examples of how context might influence selection, but a

systematic account is not given.
This underlines the importance of my intent to go into the direction of a systematic theory, which allows to make predictions about health selection under different circumstances and for different groups of actors. This task will be addressed in the next sections.

2.3. Theory of Health Selection

What theoretical foundation is there to support the health selection hypothesis? So far there is actually very little theory explaining the mechanisms behind health selection. The study with the best theoretical foundation and a very important exception to that rule is the study by Mastekaasa (1996) which is presented in section 2.2. It seems that often the theory is considered to be too obvious to explain. So, only the hypothesis is stated and then the analyses begin. For my purpose this is not sufficient. Without a clear theoretical formulation, testing health selection effects seems to be a merely exploratory endeavor. Evaluating the results of my study would also be harder, because no expectations could be formulated. One additional thing that cannot be done without a theory is making predictions as to where health selection effects should *not* appear. Yet, such a prediction is as important as the conventional health selection hypothesis. If the hypothesis is not supported by the data it is unclear what kind of conclusions can be drawn for different contexts, for different indicators of health inequalities, or for different measures of social positions. It is therefore key to make an attempt at developing a theory of health selection. Formulating such an explicit theory of health selection will be one of the contributions of this thesis. It allows me to investigate the conditions under which the health selection hypothesis is valid and where its limitations lie. This will help guiding research on health inequalities in the future. It also shows that health inequalities due to health selection depend on a wide range of social conditions and can be modified by such conditions. It will thus become clear that health selection is a form of *Unnatural Selection*.
Where do we start in the quest for a theory of health selection? Usually, it is best to start with the simplest theory available. We can evaluate if it can explain the phenomenon under scrutiny and afterwards adjust or rephrase the theory using additional or less restrictive assumptions. This is how I will proceed here. The easiest way to link health and labor market rewards is by human capital theory. I will elaborate the human capital model, its assumptions and its implications for the study of health selection. Then, I will evaluate whether the theory is sufficient for my purposes or not.

2.4. Health Selection - from Hypothesis to Theory

2.4.1. Human Capital Theory

One of the most well known theories in labor economics is human capital theory. Human capital theory is an extension of neoclassical theories of the labor market. It knows two actors: employers demanding labor and workers supplying it.

> "Neoclassical labor economics consists, in brief, of the marginal productivity theory of demand-based on profit maximizing behavior of employers-and a supply theory based on utility maximization of workers." (Cain 1976, 1216)

For the employers it is important to note that they are assumed to be profit maximizing rational, unitary actors. In equilibrium of the labor market employers will pay workers an hourly wage equal to the marginal profit they get from the last hour of work the worker does. If for some reason marginal productivity is lower than hourly wage, the employer either reduces the wage or reduces the hours of employment for the worker until marginal productivity and wages are equal again. One can see that both work hours and wages are seen as completely flexible in this model.

Looking at the worker we are also assuming utility maximizing rational actors which draw their utility from the wages they earn at work and their leisure time. Workers will offer so many hours of work on the labor market until the utility they gain from the income of their last hour of work is less than the utility they would gain from the same hour in leisure. When this is the case, is determined by their preferences for leisure and income. Workers are therefore only willing to work for a minimum of wage per hour which is called the reservation wage. So far this is all in line with traditional neoclassical labor market theory. Human capital theory makes one important addition to the model.

Workers are not assumed to be uniformly productive. Instead their productivity depends, as the name suggests, on their human capital. This consists of e.g. education, training, and experience at work. Human capital is seen as an investment in analogy to physical capital. This investment can be made either by the worker or the employer. For her investment in human capital the worker usually forgoes income for a period of time and might have additional costs like tuition fees. These costs need to be compensated in form of higher wages. The employer is willing to cover these additional labor costs due to the higher productivity, which in turn results from education, training or experience. Put differently, workers will only invest in their human capital if they expect the returns to this investment in form of wages to be equal or higher than the costs of the investment.

Human capital can be further distinguished into general human capital, occupational specific human capital (Kambourov & Manovskii 2009), and firm specific human capital (Hashimoto 1981, Becker 1994, Lazear 2003). The first increases productivity of the worker regardless of

whom he works for. The second type increases productivity of the worker in all firms and for all employers as long as the worker is working in the occupation or profession he was trained in. Last, firm specific human capital only increases the productivity of workers as long as they work for the firm they were trained in.
Workers are expected to be less interested in investing in firm specific human capital, because they will lose their investment as soon as they change the employer (for a better paying job or if they are fired, for example). On the other hand employers have little interest in financing general human capital, because the worker can easily transfer the human capital when quitting the firm, as it is as useful to him at any other firm. In this case, the employer can easily lose the investment made.
Human capital theory argues that there can be short-term imperfections so that some workers earn more or than their stock of human capital would predict. Market forces will ensure however that all workers have the same income[2] - given same preferences for leisure and income - over their life course. Higher educated persons get their human capital investments back through higher wages and persons who invested less had a longer period of time earning wages or had less costs.

2.4.2. Human Capital Theory and Health

Now we have reviewed the basic idea of human capital theory. There are uncounted numbers of extensions and modifications. For my purpose the basics are enough. What has not been said is how health fits into this model. So far only human capital has been mentioned. Fortunately, Gary Becker himself developed a model which incorporates the effort a person spends on his work as one additional determinant of wages. Effort will be the important link between an individual's health and her labor market rewards. How this is accomplished will be shown in this section. In the end, we will have a model which predicts the effect of health on labor market rewards. The model also states the basic conditions under which health selection is to be expected. It is also the starting point to look for gender differences in health effects on the labor market.

Becker (1994) sees health as a human capital investment. It can increase productivity in the same way as training or education can (Becker 1994, Mushkin 1962). The analogy between health and education with regard to productivity has been termed health capital theory (Stern 1983, 42). Health capital increases the time a person can spend working and earning wages and commodities (Grossman 1972).

[2]Though not necessarily the same accumulated wages. They will differ if costs other than lost time to work are needed to gain more human capital. Tuition fees should make such a difference. Paying a student loan will need higher overall wages to compensate the investment, but will lead to the same total net income over the life course.

One of the most well-known phenomena connecting health selection and labor market processes is the so called healthy-worker-effect (McMichael, Spirtas & Kupper 1974). The healthy-worker-effect hypothesis states that in order to participate in the working force an individual has to have a minimum level of good health. Those who do not reach this level cannot participate in the labor force. The sick therefore become, stay, or already are unemployed or not-employed. On aggregate this leads to the empirical observation that those in the labor force are more healthy than those who are not part of the labor force. The magnitude of the healthy-worker-effect can vary among different sub-populations of the working force (Li & Sung 1999). There is also some evidence for health selection between occupations. Those who are worse off with their health choose other jobs which are less endangering to their health (Li & Sung 1999, Ostlin 1988).

After these introductory examples, I will now go into detail about how health affects a person's productivity, performance, and labor market rewards.
Health constitutes an important resource for a person. Effort spend on the job costs energy and creates the need for recovery. Several studies show that there is an inverse relationship between health, exhaustion and need for recovery (Sluiter, van der Beek & Frings-Dresen 1999, Sluiter, Frings-Dresen, van der Beek & Meijman 2001, Sluiter 2003). Other studies show a strong association between subjective health and sickness absence (Ferrie, Kivimäki, Head, Shipley, Vahtera & Marmot 2005, Eriksson, von Celsing, Wahlström, Janson, Zander & Wallman 2008, Roelen, Koopmans & Groothoff 2010).
I will argue that the state of health of workers is an important factor for their labor market outcomes. Later, I will develop the theory further allowing for differences in the health effect between men and women.
Most theories deal with wage effects of certain health characteristics of workers. I will just refer to rewards in general, because my empirical analyses refer to job positions. It is also the most general assumption that fulfilling certain tasks within a job are rewarded by certain benefits, whatever their nature (Sørensen 1983, 205). It is thereby a more general approach and allows for an easier adaption to different labor market contexts.
Human capital theory argues that labor market rewards increase with work hours, human capital, and the effort spent per hour of work (Becker 1985, S44).

The effort persons can spend during their hours at work is limited, because their overall time budget is limited (Galama & van Kippersluis 2010, 10). The effort at work depends on the overall amount of energy available, the effort needed for other activities outside the labor market, and the ability to regenerate energy. All three factors can be directly or indirectly influenced by a person's health status.
The overall amount of energy depends on a person's physical and mental resources to deal with problems. If a person is taken ill, or has a long-standing physical impairment, a part of the energy a person has is spent on fighting the illness, coping with the impairment, and recovery

in general. This leaves less energy for all other activities, including paid work.
Illnesses and health impairments often demand a lot of time and attention by the stricken person. Doctor visits, hospital stays, therapy sessions or longer time needed for day-to-day activities are just some examples of how impaired health may lead to increased off-labor-market efforts that are (in)directly related to health problems.
Sleep, leisure time, and relaxation are important for recovering energy spend on different activities on and off the labor market. If a person does not have enough time or support to recover the energy needed, the person either has to spend overall less energy or has to "borrow" energy (Becker 1977, 30).
Energy can be borrowed from time to come, so that one has to deal with reduced energy in the future. This may be both in the close, e.g. fatigue at weekend (Demerouti, Blanc, Bakker, Schaufeli & Hox 2009), or in the distant future, e.g. burnout, or chronic health problems (Paringer 1983). For example, within the German context Schnitzlein (2011) finds that taking less holidays impairs subsequent subjective health. For another empirical study see e.g. de Croon, Sluiter & Frings-Dresen (2003).
If a period of illness occurs, persons therefore have to decide whether to use energy now at the expense of less energy in the future or to reduce effort at work now. Both options carry a risk. The problem is that usually not enough information exists to make a completely informed decision. Due to this lack of information I argue that persons rely on what they know or think about work, recovery, and health. This knowledge is usually based on experiences at work, on how absenteeism is received there, and on knowledge about regaining strength, long-term fatigue, illnesses, etc. The decision will therefore be influenced by health related behavior and values learned and adopted through socialization in childhood, school, and at work. It is thus feasible to expect that the possibility of borrowing energy is used to different extents by men and women. Why this is the case and why this might be important for the relationship between health and LMR is a separate question which I will address in section 2.6.1.
I add a second way of borrowing energy. Energy can also be borrowed from other persons in which case they have to take over part of the work a person has to do. In case of illnesses or reduced overall health the demand for recovery is usually greater than in times of good health. In fact, increased sickness absence is one way to deal with a high demand for recovery. Another way would be to externalize non-labor-market-activities to other persons. A partner could take over housework, childcare, or other chores which would allow for more time to recover. In this way one would indirectly borrow energy from one's partner.

The effect of less effort can be seen in either a reduction of work hours or a reduction of effort per hour. Especially the second option is often the case if health impairments are not too severe or if economic constraints do not allow a reduction of work hours (through sick days). Sometimes this reduction might be even unwittingly if rather latent factors like mental health problems, lack of sleep or related phenomena are the cause of the health situation. In any case

the worker will get less work done in the same amount of time or the quality of the work is reduced. Overall productivity can therefore be severely reduced even if work hours are not reduced. This should lead to a reduction in labor market rewards, especially if the health state is impaired for a longer period of time (for a similar argumentation, see Grossman 1976)[3]. This is the basic model of health, effort, and labor market rewards. Becker (1985, S44) provides a formalization of his general model that allows to link effort to income. The general is equation is:

$$I = \alpha e^{\sigma} t, 0 < \sigma < 1 \tag{2.1}$$

I stands for income, α represents human capital of the individual, e is effort per hour, t are the hours of work on the labor market, and σ stands for the effort intensity of the job. The effort intensity modifies the relation between income and effort. This means that the return to effort depends on how effort intensive a job is. This interesting proposition is discussed in detail in section 2.4.3. For my purposes the model can be generalized to consider all forms of labor market rewards instead of income. In addition, I will develop the hypothesis that the effort-per-hour a person can show at work is a function of his health (H) and the non-labor-market effort (E_{NLM}) required of him. Therefore we can make a small modification to end up with this equation:

$$LMR = \alpha e(H, E_{NLM})^{\sigma} t \tag{2.2}$$

I will pick up this formalization later in the theory building (section 2.4.3 and 2.6.2) as a way to systematize the propositions. It will also be picked up in the methods section to show how the different aspects of the theory are measured and influence the regression equation (see 4.9.2).

At this point, we can explain why health inequalities due to health selection should appear on the labor market. Human capital theory states that healthier individuals are more productive and therefore receive higher rewards or better positions, which in turn results in labor market related health inequalities. The simplicity of the theory is a great advantage. However, so far the theory is gender-neutral. It makes no distinctions between men and women. But is this a reasonable simplification of reality? In the next section, I will argue that it is indeed too simplifying for the research purpose at hand. I will first draw on theories of social inequalities and gender in general, which will raise concerns about the neglect of gender in human capital

[3]Of course, this argument can also be turned around. Workers earn more per hour, because they are healthier and can spent more effort on work (Becker 1985, Galama & van Kippersluis 2010).

theory. I will then go into more detail explaining how gender matters for health selection and how the theory of health selection must be altered to be plausible.

2.4.3. Decreasing Returns to Effort

Drawing on human capital theory one special assumption should be elaborated a bit further. This is the notion of decreasing returns to each unit of effort at work. For this purpose, it is best to start with an analogy from sports and then with an example from a hypothetical job. If we have walked for 1 km it will take us only a little effort to go another kilometer. But if we take part in the very popular Vierdaagse Nijmegen walking tour in the Netherlands we have to walk 4 times 50 kilometers to be among the finishers. At the end of each day we have walked 50 km. Going another km in the evening will take considerably more effort than after the first short 1 km walk. So, walking 1 km can take very different amounts of effort depending on how much we have already walked. Now we can turn the argument around: For each unit of effort we can walk a longer distance if we have walked only 1 km than if we have already walked 50 km. This means that each additional unit of effort will get us just a little bit less far than the unit before. If we transfer this notion to effort spent at work we can come up with the following example:

A person standing at the assembly line putting together parts for a TV can increase her output of pieces put together by working faster. Working faster costs more effort, because the person has to move more and faster, and she needs to concentrate more to make no mistakes. If the person is basically just standing next to the assembly line and only occasionally picks up two parts to put them together, she might increase her output considerably by just working a little faster and spending just a little more effort. If she is already working really fast and taking few breaks, then the same increase in effort will increase the output only a little. At some point additional effort will hardly be noticeably, so that the maximum productivity is reached. Again, we see that a unit of effort yields more gain in productivity if a person has so far spent less effort on the job than if she has already spent a lot of effort.

We should also take into account that the slope of the decrease in productivity is different for different jobs. At the assembly line each additional unit of effort has a strong impact on productivity. In contrast, if you are a door man you might still influence how well you are doing your job by putting more effort into it. But effort should have much less effect for such a job than for a job at the assembly line.

Summing it up, we can say that productivity depends on effort, but the marginal effect of effort is reduced with amount of effort already spent and increases with the effort-intensity of the job. In formal terms the argument is:

$$LMR = \alpha e(H, E_{NLM})^{\sigma} t \tag{2.3}$$

Now this section points out that the following always holds: $0 < \sigma < 1$. σ represents the effort-intensity. It is bounded by zero and one which leads to a decreasing return to effort. We can see that if we take the first partial derivative with respect to effort as the marginal effect of effort on labor market rewards:

$$\frac{\delta LMR(\alpha, t, \sigma)}{\delta e} = \sigma e^{(\sigma-1)}\alpha t \tag{2.4}$$

Rewriting this equation we get:

$$\sigma e^{(\sigma-1)}\alpha t = \sigma \frac{1}{e^{(1-\sigma)}}\alpha t \tag{2.5}$$

Here we see that the marginal effect of effort on labor market rewards is a product of the effort-intensity and more importantly depends inversely on the level of effort. The *effect of effort* depends on the *level of effort*.

2.5. Gender Differences in Health Effects

So far we have a fairly simple model of health selection that does not know any gender component. While the simplicity is convenient, the discussion of health inequalities should refer back to broader sociological debates about social inequalities. One very important topic in the analysis of social inequalities is of course gender inequality. In Germany, the study of systematic inequalities between men and women became more widespread in the 1970s. Back then the label *womens studies* was often used (Gottschall 2000, 14). Today, it has been established in the scientific community that social inequalities cannot be reduced to the analysis of class. At least gender and race need to be considered as well[4]. For the purposes of the analyses race is excluded for the moment, because a discussion would be beyond the scope of this thesis.
The starting point of my argument is the observation that even after decades of improvement of women's education and their legal rights and status women still face a disadvantage compared to men in several societal areas. Again, I will have to narrow my focus of research and will consider only labor market disadvantages. When I use the phrase disadvantage I imply that women *as a group* face structural barriers on the labor market, which are not an individual phenomenon but exist throughout society (Gottschall 2000, 12).

2.5.1. Subjective Performance Evaluations

After this very general view on structural inequalities between men and women in society I will focus on a very narrow topic. The focus is necessary to address one mechanism in labor market

[4]In this context it should be mentioned that other potentially structuring categories of analyses exist as well even if they do not have the same dispersion as gender and race. Among them are for example disability, sexual orientation and trans-gender or religion.

rewards determination that should not be seen as gender neutral for my thesis. The subject of inquiry is how employers - as one main actor in the process of labor market rewards setting - evaluate their employees and attribute rewards to their accomplishments. Standard human capital theory assumes they have perfect unbiased information on productivity. In this section we will see that this assumption is hardly feasible and should be modified for the purpose of explaining gender differences in health effects.

In my theory I assume that workers receive their labor market rewards according to the **perceived** effort, not the **actual** effort. In the following part I explain why.
Employers want to maximize their profit and therefore want to pick the most qualified candidate for a job or promotion. If criteria which can be directly compared[5] are at hand, employers will be able to assess productivity rather objectively. The (subjective) evaluation of effort in contrast is much more subject to subconscious prejudices, feelings, and errors in judgment. As it happens, rewards are most often awarded according to subjective evaluation, not objective measures of performance (Prendergast & Topel 1996, MacLeod 2003). Surprisingly, one study by Alexander & Wilkins (1982) does not even find a statistical significant association between subjective and objective measures of performance among vocational and rehabilitation counselors. Seemingly irrational judgments about performance can also be found among colleagues at the same level. In one study, considering someone for cooperation at work is only dependent on actual competence of those persons if interpersonal feelings are positive. If they are negative competence does not play a role (Casciaro & Lobo 2008). Therefore, in the following I will go into detail on gender specific problems of subjective evaluations.
This rather intuitive claim about subjective evaluations becomes especially important if we have reason to believe that there are systematic biases in evaluation towards certain social groups. There is substantial research from the fields of (organizational) psychology which backs the claim about the subjectivity of performance evaluation and a related gender bias. The argument below holds in case we are talking about an employer as an actual individual, but also for the employer seen as a firm or as another type of organization. In classical organizational theory the subject of investigation is often conceptualized as gender neutral. The rationale behind this approach is that the defining elements of an organization in the classical view is *the rationalization of all social processes* (Wilz 2002, chapter 1).
Analog to the critique of neoclassical theories of the labor market we can reasonably doubt the adequacy of a gender neutral approach here. Recent empirical studies and the development of theories of gendered organizations also cast serious doubt on the classical view (Wilz 2002, 44-46). For the purpose at hand, this means that performance evaluation can be seen as subjective regardless whether the employer is an individual or an organization.

[5]Such as work hours, tenure, piece-rates, or credentials.

A review of the literature allows the statement that subjective evaluation often shows considerable gender (or race) biases. This is important because of the finding that women are assigned to jobs where effort is easier to monitor while men's jobs encourage effort by efficiency wages (Bielby & Bielby 2002, 197). Kanter (1977, 216) writes that such differences in surveillance are integral part of male company culture:

> "The Token[6] does not have to work hard to have her presence noticed, but she does have to work hard to have her achievements noticed."

Kanter (1977, 219) states also that persons in Token positions are under much stronger scrutiny, have to perform higher, and need to make bigger efforts at fitting in, not standing out too much, keeping themselves constantly under control which is very taxing.

In the following I will give some examples of studies which warrant a claim of subjective evaluation that might result in a gender bias.

If performance pay based on objective measures like piece rate or commissions is considered the gender pay gap is reduced (Madden 2012). This finding indicates that other pay schemes based on subjective evaluation contribute to the gender bias. Cohen & Huffman (2007) can show that having female members in high status management positions lowers the gender wage gap among general employees. Elvira & Saporta (2001) can show that given same productivity blacks receive less favorable ratings from their supervisors than whites in a large US company. Racial wage differentials disappear when job allocation and *subjective* performance evaluation are controlled for (Elvira & Saporta 2001, 587). Among managers, it was found that supervisors were less likely to attribute performance to ability in case of female managers than in case of male managers (Greenhaus, Parasuraman & Wormley 1990). In a study by Igbaria & Baroudi (1995) a gender bias in performance evaluation could not be found. On the other hand, there was a gender bias in the supervisors' perception of chances for promotion, favoring men. This result is replicated by a meta-analysis in the study of Roth, Purvis & Bobko (2012). An experiment conducted by Maas & Torres-González (2011) shows that women expect to be rated lower if the proportion of raters is predominantly male which corresponds to the finding from field research that women are less favorably evaluated the smaller the proportion of women is among the raters (Sackett, DuBois & Noe 1991). Bohnet, Bazerman & Geen (2012) suggest that joint evaluation of workers or applicants could overcome gender bias in subjective evaluations as it makes comparison, contrasting and calibration of evaluation easier. These new findings corresponds to older views in the economic literature on internal labor markets. Doeringer & Piore (1985, 137-140) argue in the context of internal labor markets, that discriminatory practices at entry level are closely related to

1. the informality of the screening and recruitment process.
2. variations in the process due to changes in job nature.

[6]Token refers to persons in very clear minority position (less than 15 % of the whole population).

3. statistical nature of the screening process.

4. reliance on limited channels of recruitment.

All of these factors might impair women's chances in comparison to men's.

However, it has to be conceded, that some studies do not find clear gender effects in the evaluation of jobs (Grams & Schwab 1985, Graves & Powell 1995, Bowen, Swim & Jacobs 2000). Also, in the context of more standardized ways of evaluation (and possibly affirmative action), race or gender effects of evaluation might be reduced (Powell & Butterfield 1997, 125).
Overall, the theoretical argument and the empirical research allow the conclusion that - given the same *actual* effort - a disadvantaged group will receive less favorable evaluations. They are considered as if they had spent less actual effort. Combined with the classical human capital theory approach of wage and labor market rewards determination this leads to the conclusion that a discriminated group will receive less labor market rewards for the same actual effort than the reference group.

2.5.2. Women's Disadvantage on the Labor Market

For certain highly qualified positions on the labor market special skills, training, and qualifications are needed. In addition, a lot of effort has to be put into acquiring and keeping such a position as they are very demanding and are granted only to high performing individuals. Therefore health capital is very important for obtaining and keeping these jobs, because the applicant or incumbent needs good health to invest a lot of effort to show the performance required of her.

What follows is an argument explaining how gender differences in the health effect with regard to highly qualified positions might arise. The main assumption is that women face a certain disadvantage in gaining a high status job and in earning wages. The use of a very broad meaning of disadvantage is deliberately chosen, because the origin of the disadvantage does not play a role for my theory. I will review some theories and studies which suggest different ways of how such a disadvantage can come into existence without giving precedence for one or another theory. Each of the mechanisms described in the theories is deemed to be sufficient, but not necessary, to establish a disadvantage.
By disadvantage I mean that members of a certain group - for whatever reasons - need more overall effort than members of another group to get the same reward. My use of the word disadvantage should not be understood as normative in the sense that the stated differences between groups are just or unjust, good or bad. The definition has only analytical, but no normative implications. All discussions about the best way to explain the gender pay gap or the gender gap in high status jobs are better suited for other studies, as are the normative implications of these gender gaps.

Among the many theories explaining the gender pay gap and the gender gap in managerial positions I will only highlight a few. I refer to theories on discrimination, social networks at work, personal characteristics, and the household context.

Highly qualified and managerial jobs are usually held by men. A lot of studies have claimed that women face gender discrimination when trying to obtain such a position (Eagly & Carli 2007, chapter 5). Relative to men their overall performance has to be higher to compensate discrimination. One of the results of such discrimination is that women need to be especially good at their job and need to spend considerably more effort on their work than men to get promoted to such a position. This can be explained with the concepts of *taste for discrimination* as proposed by Becker (1971) or with statistical discrimination (Phelps 1972, Thurow 1975). For example, in the case of statistical discrimination (supposedly) higher levels of sickness absence of women in general could lead employers to promote mostly men which are expected to be less absent from work (regardless of whether this is the case for the individual worker). Statistical discrimination can work through different skill levels or different signals for skill levels between men and women (Bjerk 2008). An overall higher rate of quitting by women (Frederiksen 2008) might also lead to reduced opportunities of women for promotion.

Another approach to theorizing discrimination is the theory of taste for discrimination. Here the assumption is that discriminating practices in themselves have a certain indirect utility gain for the employer. They simply prefer not to employ or work with members of certain social groups even if it means that their profit suffers from such a decision.

In a seminal qualitative study in the 1970s Kanter (1977) provides groundbreaking theory and empirical material for the analysis of gender relations at the workplace. Since then many studies with similar intent have been published inspired by Kanter's approach. In her theory the taste for discrimination can be explained e.g. by a company and leadership culture dominated by men through their numerical superiority[7] Kanter (1977):

> "Quite apart from the content of particular jobs and their location in the hierarchy, the culture of corporate administration and the experiences of men in it were influenced by this fact of numerical dominance, by the fact that men were the *many*." [Emphasis in the original] (Kanter 1977, 206)

Token status in this sense means clear numerical minority status within a certain context. This implies negative consequences for promotion chances and rewards in general. In these contexts persons in minority or token status need to outperform the majority group. They

[7]The author attributes the culture of dominance as an environment for women not due do femaleness, but to rarity and scarcity of women in the company (Kanter 1977, 207). A group with a ratio of 85:15 is classified as *skewed*, 100:0 *uniform*, 65:35 *majority vs. minority*, and 50:50 is *balanced* (Kanter 1977, 208). Kanter (1977, 210-211) argues that minorities or tokens get more attention, are contrasted (possibly in a exaggerated way) against the majority and generalizations about this group are more often made.

have to rely heavily on good health to be able to show such a performance. This leads to the hypothesis that in a male dominated context women's health should be more important for labor market success than men's health. Although the theory was developed from a gender perspective where women are the minority group, Kanter (1977) states that the theory is generalizable to other types of groups and is symmetric. This means that in a female dominated context men's health should be more important than women's health for labor market success, because under these circumstances men are in a token position.

Building on theories of discrimination and male dominated company culture, most studies agree that wage or promotion gaps cannot be explained by differences in relevant criteria like education, experience or occupation alone. At this point it is useful to take a small detour to the issue of the gender wage gap and then come back to the gender promotion gap, because they are interlinked. However, the gender wage gap is better known and has been investigated more often.

There are several ways of presenting the gender wage gap, each having a different interpretation and way of estimating it. As Kunze (2008, 74) puts it: "There is no undisputed method of measuring the gender wage gap". It should be noted that this can easily become a political issue. I try to avoid this and will explain later how.

First, there is the overall gender pay gap which is usually presented as the percentage of wage-per-hour that women earn less than men.

Following the model of labor market rewards by Becker (1985), wage differences will arise if men and women have different levels of accumulated human capital. Often this is controlled for in a regression and the remaining difference between men and women is then called the unexplained gender wage gap (Kunze 2008, 68) or the adjusted gender wage gap. Taking only part of human capital variables into account can lead to big differences in the estimation of the gender wage gap (Weichselbaumer & Winter-Ebmer 2005). Taking these ideas into account, in the methods part it will be discussed which controls for differences in human capital endowments between men and women are chosen for the empirical analysis (section 4.9).

Sometimes it is argued that occupations dominated by men require heavier work which is physically more straining and has to be compensated by higher wages to attract sufficient labor supply (Viscusi 1978, Viscusi & Moore 1987, Filer 1985, Okamoto & England 1999). This leads to the hypothesis that controlling for the physical (and also psychological strain) in an occupation might explain the gender wage gap. However, empirical investigations cast doubts on this theory. Jacobs & Steinberg (1990) and Kilbourne, Farkas, Beron, Weir & England (1994) show that occupations with physical strain do not necessarily pay higher wages. Hersch (1998) uses a different method and does find compensating differentials for both genders. Similar results are found by Cousineau, Lacroix & Girard (1992). Another study found that both men and women receive compensation differentials. While for men these compensations are higher for risks of fatal injuries, for women they are higher for non-fatal injuries (Leeth &

Ruser 2003). Macpherson & Hirsch (1995) can show that job hazards and the environment do affect rewards significantly, but reduce the effect of female-percentage in a job on wages only slightly. For Germany a study by Liebeskind (2004) cannot find any substantial reduction of the gender wage gap after adjusting for physical strain. The overall results are inconclusive, therefore compensating differentials cannot be disregarded and occupational strain will be taken into account in this thesis. This is of special importance as health as a predictive factor might correlate with the strain of occupation.
Another important part of the gender wage gap is occupational segregation. This refers to the fact that a lot of occupations are dominated by either men or women. Occupational segregation can impact differences in wages, likelihood of promotion and job security between men and women (Busch & Holst 2012). For Germany there are also other studies that find that gender specific occupational segregation and in some cases segregation by industry is one factor in explaining the gender wage gap (e.g. Leuze & Strauß 2009, Achatz, Gartner & Glück 2005, Hinz & Gartner 2005, Liebeskind 2004). Consequently, the industry of the employer will also be taken into account in all empirical models on gender specific health selection mechanisms.

Similar to the gender wage gap the small proportion of women among high status jobs and leadership positions can be seen as a combination of differences in human capital endowments, occupational segregation, and unexplained factors which might present barriers or "glass ceilings". These unexplained factors are what is targeted by the theories of Eagly & Carli (2007) or Kanter (1977).

Even among female dominated occupations promotions are sometimes more likely to go to men than to women. It should be noted that the famous "glass ceiling" effect is contested in the literature. The "glass ceiling" hypothesis states that it gets constantly harder for women to get promoted the higher the desired position is. The more authority is at stake the stronger the disadvantage. Some authors however point out that disadvantages start earlier and strong underrepresentation of women in the absolute top management can also be explained by constant disadvantage or even decreasing disadvantage (Eagly & Carli 2007).

Linked to this research are studies which find opposite results. Higher percentages of women in an occupation result in an increased chance of promotion for men in one country (Hultin 2003), but they lead to a decreased chance of promotion for men in a study in the US (Maume 1999).
This points to a theory called "glass-escalator" theory (Williams 1992), which is opposed to some of the predictions derived from Kanter's (1977) theory. Hultin (2003) finds that men have markedly higher promotion chances than women in female dominated occupations. In male dominated occupations there are no significant differences in chances of promotion between men and women. The author draws on theoretical explanations for the "glass-escalator" effect developed by Williams (1992). Coworkers welcome men in female dominated occupations as bearers of potential prestige and pay-raise giving them a better standing within the occupational

field. Supervisors, who are in the majority men, also favor men over women due to homophily. Clients who are used to women in female dominated jobs want to be treated by women rather than men. Since a lot of female dominated occupations involve high interaction with clients (e.g. care-jobs, nursing, social work) men are promoted to higher or supervisory positions which require less client interaction to circumvent client disapproval (Hultin 2003, 36-37). The finding that women have the same promotion opportunities as men in male dominated occupations is interpreted not as disproving the argument of discrimination or exclusion, but rather pointing to a different mechanism of exclusion which works at the occupation entry level, but not afterwards (Hultin 2003, 54). However, not every study finds the glass-escalator effect (e.g. Kullberg 2012, Snyder & Green 2008).

At this point we must acknowledge research which indicates that the choice of occupation is influenced strongly by gendered socialization. Referring back to socialization recognizes that social structures, processes, norms, and values influence parents in the upbringing and education of their children. Thus parents do not choose their way of raising their children independently of society (Hurrelmann 1994). Women are influenced in a different way than men during childhood in their role formation: "Playing doctor or playing nurse" (Cain 1976, 1236). Such childhood influences present another disadvantage for women in attaining the same labor market rewards as men.

This leads us to another important field that can induce a disadvantage for women on the labor market. These are gendered responsibilities in the household and in the family. It should be taken into account that women might choose occupations which are less effort intensive, because they need to spend more effort on non-labor-market activities. Gendered division of household labor can thus lead to a gendered division of the labor market (Becker 1985, Polachek 1981). The household and family context has been shown to play a significant role in determining career chances (Stone & Lovejoy 2004). Women are much more constrained by non-labor-market activities than men (Dempsey 2000, Bianchi, Milkie, Sayer & Robinson 2000). These activities include childcare, housework, and care for family members all of which are often less flexible than men's chores (Hook 2010). Family responsibilities constitute a strain on women's resources, because they cannot spend these resources on their job. The resources concern both time and effort. In addition, women might suffer from employers' expectation about the *potential* of these extra burdens, which increases tendencies for statistical discrimination (Ortiz & Roscigno 2009). Most notably potential or actual drop-outs from the job due to pregnancy are often reasons not to hire a woman for a leadership position early in her career (on the wage penalty for motherhood and marriage, see Budig & England 2001, Loughran & Zissimopoulos 2009). Time off to care for children can have a similar effect. Maternity leave depreciates human capital, a situation men (usually) do not face (Staff & Mortimer 2012). Summing up, we can say that expected and actual family strains constitute a major disadvantage for women on the labor market.

A third important factor determining the difference between men and women in obtaining high status positions are social contacts and networks (Eagly & Carli 2007, 144). Social contacts and networks can facilitate three things.
First, information can be easier transported than through formal channels alone (Granovetter 1973, Burt 1995, Lin 1999). This holds true for directly transmitted information or information given by third parties, sometimes in the form of recommendations (Franzen & Hangartner 2005). Employers are better informed about the performance and productivity of men than of women. They also have better access to information about characteristics of the male worker like personality, reliability, or productivity at a former job, which are hard to certify (Flap & Völker 2001, 163).
Second, trust can be facilitated via social networks (Burt 1995, 15). This means that although employers do not have more direct information about men than about women, they do have higher trust in men due to recommendations or personal contact. Both trust and additional information reduce the costs of evaluating and hiring workers (Gorman, Marsden, Kalleberg & Berg 2001, 107-109). This makes it more convenient for employers to give preferential treatment to those persons for whom informal information is available.
Third, social contacts and networks can facilitate personal preferences for working with certain persons which are not grounded in professional performance but in personal feelings of sympathy, affection or homophily (Mount, Sytsma, Hazucha & Holt 1997, McPherson, Smith-Lovin & Cook 2001, McDonald 2011). Reskin & McBrier (2000) can show that open recruitment processes reduce disadvantages of women in contrast to recruitment through informal networks. Networks of incumbents of managerial positions, which systematically keep women out, are referred to as *old boy networks* (Oakley 2000, 328-329). Homophily is also at the bottom of a potential taste for discrimination of employers against women.
All three ways in which social networks at work operate can lead to a systematic disadvantage for women, because their networks are far more focused on private and family context than men's networks (Campbell 1988, Moore 1990, McDonald, Lin & Ao 2009, McDonald 2011).

Women's values could also be a cause for disadvantage, although empirical validity of this claim is contested (Burke & McKeen 1994). It is well known that men favor higher wages while women are more focused on other kind of non-pecuniary rewards (e.g. Marini, Fan, Finley & Beutel 1996). This can include a rewarding content of a job, or the possibility to have both career and family (Cinamon & Rich 2002). More generally - and referring to the comprehensive value framework of Schwartz - men show higher scores on values like power and achievement, while women tend to value benevolence and universalism higher (Schwartz & Rubel 2005). Higher values in the self-enhancement sphere could lead to higher priorities for advancement at work and a stronger focus on achieving goals at work at the expense of other activities aside from work. Therefore men have an advantage regarding values compared to women. As values are assumed to be personal characteristics which are quite stable, methodological approaches

which can control for time constant unobserved heterogeneity like a fixed-effects approach are valuable in controlling for differences in values.

Escriche (2007) argues[8] that women's preference for family over career will persist as a minority preference even if the prevalence of the preference drops. A minority preference in this sense is a preference held by a clear numerical minority of the reference society. The idea is that these preferences will not die out because those who have them do not assimilate. Instead they invest more in teaching their children their values and preferences. The additional investment is made due to their knowledge that society will most likely not teach their kids the desired values. At the same time those in a majority position will invest less in teaching their children their preferences, because they know it is likely that the children will adopt the majority preferences anyway. This presents a rational-choice approach to utility maximization with regard to preference transmission from one generation to the next. Specifically, Escriche (2007) claims that a traditional role model for women (less career oriented than men) has the characteristics of such a minority preference and will remain as such in the prediction of the theoretical model. This would lead to the fact that women will continually face statistical discrimination on the labor market, because employers cannot differentiate between career or family oriented workers. However, they want to hire preferably career oriented persons. Additionally, discriminatory practices and lack of success on the labor market can lead to less taste for work which leads to a vicious circle of less and less success on the labor market (Cain 1976, 1223).

If women (have to) make a trade off (e.g. in favor of family responsibilities) at the expense of higher wages or promotion they have a relative disadvantage. They could for example choose more flexible working hours, a job closer to home, or a better work environment instead of more traditional rewards. It can be said that individual behavior based on preferences for work or family (Hakim 1998, Hakim 2002) and decisions in interaction with structural constraints can reinforce the disadvantage of women on the labor market. However, one should be cautious to adopt a "blaming the victim" stand in this matter as the interplay of individual decisions, values, and constraints are often too complex for such simple conclusions (Gottschall 2000, 277-279).

A related subject are bargaining skills and self-assessment. Women tend to be more modest in their bargaining about wages and job positions. They also are more likely than men to underestimate their own performance. This will lead to a weaker position when bargaining for wages or promotions. Values, preferences, and bargaining behavior are theoretical mechanisms that explain why women earn less for the same work or why they are less often promoted than men (Stuhlmacher & Walters 1999, Kray, Galinsky & Thompson 2002, Stevens, Bavetta & Gist 1993).

[8] based on a model of intergenerational transmission by Bisin & Verdier (1998).

2.5.3. The Result of Disadvantage and Subjective Evaluation

In the previous sections we have established that performance evaluation is subjective and disfavors certain groups. We then saw that for several reasons women are a disadvantaged group on the labor market.
Given a bias in performance evaluation, women need to show more absolute effort to gain the same evaluation of their effort. To ensure that women can spend more effort for a longer period of time it is important that they are in good health. To be precise women's health should be more important for getting in a high status position than men's health, because they have to spend relatively more effort on an already demanding job which makes it highly dependent on their health capital.

So far I have given intuitive reasoning for gender differences in the impact of health on labor market rewards. For many purposes this might suffice. However, as the argument is just an extension of the basic human capital model not a refutation, it makes sense to formalize the argument above in the way Becker does for the human capital theory. This makes it comparable to the original and gives another perspective on the same problem under more formalized conditions.

$$I = \alpha e^{\sigma} t, 0 < \sigma < 1 \tag{2.6}$$

To recapitulate what was defined above: I is income, α is human capital, e is the effort per hour, σ the effort intensity of the job and t the hours of work. I replace income by labor market rewards to make a more general case. Effort also becomes a function of health (H) and non-labor-market effort (E_{NLM}). The important alteration of the equations shown above is that I take the theory on discrepancies between actual and perceived effort into account. I will therefore replace effort in the equation by perceived effort ϵ for men (m) and women (f) which depend on a perception factor τ that has a gender bias.

$$\epsilon_f = e(H, E_{NLM}) * \tau_f \tag{2.7}$$
$$\epsilon_m = e(H, E_{NLM}) * \tau_m \tag{2.8}$$

In the argument above I have argued that the same actual effort is on average evaluated as being less for women than men. That means the same actual effort leads to a smaller perceived

effort. So, assuming a gender bias in perception, we conclude that:

$$0 < \tau_f < \tau_m < 1 \tag{2.9}$$

The new model before substituting actual effort for perceived effort is:

$$LMR = \alpha\epsilon^{\sigma}t \tag{2.10}$$

If we now take the first partial derivative with respect to perceived effort as the marginal effect of effort on labor market rewards we get:

$$\frac{\delta LMR(\alpha, t, \sigma)}{\delta\epsilon} = \sigma\epsilon^{(\sigma-1)}\alpha t \tag{2.11}$$

Rewriting this equation we get:

$$\sigma\epsilon^{(\sigma-1)}\alpha t = \sigma\frac{1}{\epsilon^{(1-\sigma)}}\alpha t \tag{2.12}$$

To get health into the equation, we have to refer back to actual effort instead of perceived effort, because it is the actual effort that is a function of health. Inserting actual effort instead we get:

$$\sigma\frac{1}{\epsilon^{(1-\sigma)}}\alpha t = \sigma\frac{1}{(e(H, E_{NLM}) * \tau)^{(1-\sigma)}}\alpha t \tag{2.13}$$

We know that $1-\sigma$ is by definition positive as σ only takes values between 0 and 1. Comparing the effect for men and women - given the same health status - it holds for any possible σ:

$$\sigma\frac{1}{(e(H, E_{NLM}) * \tau_f)^{(1-\sigma)}}\alpha t > \sigma\frac{1}{(e(H, E_{NLM}) * \tau_m)^{(1-\sigma)}}\alpha t \quad | \quad H \tag{2.14}$$

It follows that a change in health results in higher return to labor market rewards for women than for men.

2.5.4. Visibility of Health Problems

I have assumed that a reduction in effort will be noticed by the employer and will lead to reduced labor market rewards. But do employers really notice if you are a bit tardy at work? Or is it only a problem as soon as you faint at work, because you are so ill? It is worth thinking the different possibilities through and see how they will alter our conclusions about the influence of health on labor market rewards.

Introducing effort as an important determinant for labor market outcomes assumes that employers can (one way or another) assess or monitor the effort an individual worker makes (Becker 1985, S43). Thus, making a distinction between health effects, which are directly

visible to the employer and those who are only indirectly visible seems appropriate. One obvious kind of health effect that is directly visible are days of sickness absence. An employer can count these days and calculate how much productivity of each of the workers in the firm is lost due to sick days off. The other obvious effect would be a reduction in work hours by the worker. The latter usually automatically reduces the labor market rewards of the worker, at least as long as he is paid by the hour.

However, one can also conceive of health influencing productivity via the effort per hour (section 2.4). This is especially important in a labor market environment like Germany which has rigid labor market contracts and where full-time employment is not only normal, but also the *norm* (Pierenkemper & Zimmermann 2009). If a reduction in work hours is not an option, reduced effort per hour could be the only way to react to a health impairment. In a severe case this would lead to a behavior, which is referred to as *presenteeism* in the literature. This means that an individual goes to work although he or she is in fact ill and should stay at home for recovery[9]. Presenteeism increases among other things with the degree of job insecurity and with high job demands (Demerouti et al. 2009, Johns 2010).

Reduction of effort per hour is a lot harder for employers to monitor. If the employment is not based on piece work, reduced effort per hour can be seen as a health effect that is only *indirectly visible* (if at all).

This problem appears in the academic literature as well. In a review article by Edington & Schultz (2008) about the impact of health risks on productivity, the authors report only studies using presenteeism and absenteeism as measures of productivity. Other measures are usually not available for practical reasons.

Effort that is not directly visible is much more prone to errors in judgment, and to less certain evaluations (discussed in detail in section 2.5.1). The employer would have to assess the output a worker produces in a certain amount of time. If the work is highly specialized the employer might even lack the means to monitor or control the effort a worker spends at work completely (see e.g. Sørensen 1996). Another reason why workers are not monitored is that employers might want to avoid negative consequences of monitoring and surveillance which were found in some recent studies (Dittrich & Kocher 2011, Hasan, Akif, Subhani & Imtiaz 2012, O'Donnell, Ryan & Jetten 2013) like reduced quality of work or a breach of trust.

This raises the question of how much workers are monitored. Control systems implemented at work should make reduced productivity more visible to the employer. It constitutes an information advantage (or a reduction in an information disadvantage if you will) which enables the employer to make informed decisions.

The employer will then be able to react better to such a loss in productivity. The stronger such systems of controlling employees are, the stronger the link between health and labor market rewards should get. However, in the last decades new forms of management have arisen.

[9]Some studies show that presenteeism might even be more economical harmful than its antonym *absenteeism* (Collins, Baase, Sharda, Ozminkowski, Nicholson, Billotti, Turpin, Olson & Berger 2005).

Foremost the High Performance Management has risen as the most important post-fordistic paradigm of work organization and worker control (Butler, Felstead, Ashton, Fuller, Lee, Unwin & Walters 2004). Here responsibility for workers actions, their performance and output is often delegated from higher levels of authority like supervisors to the employees themselves. From an employee perspective German sociologists have created the concept and term of "Arbeitskraftunternehmer" or "entreployees" which neatly describes the consequences of High Performance Management for employees (Voß & Pongratz 1998, Pongratz & Voß 2003).
Another insight from the distinction between visible and non-visible forms of health problems is that one might expect differences between the effects of individual health status and sickness absence on labor market rewards. At last, the theoretical discussion is not developed enough to allow a directed hypothesis in this area. The analyses will thus be of more exploratory nature. One clue we might get is that there are studies reporting that men are more often faced with a culture of presenteeism. The study by Watts (2009, 520,525) about managers in constructions sites reveals that men build a culture of competitive presenteeism which requires them to be at work at all costs. This means that sickness absence is penalized stronger than for women. Therefore one could expect that job status is more strongly affected by sickness absence in the case of men than in the case of women. Piha, Laaksonen, Martikainen, Rahkonen & Lahelma (2010) also show that higher education and occupational class are associated with reduced sickness absence among municipal employees in Helsinki. These associations are markedly stronger for men than for women. Avdic & Johansson (2013) conduct a study that provides an indirect test of preferences for sickness absence. They conclude that men indeed have a higher preference for few days of sickness absence than women. The theoretical argument is that women's double role in household and work requires them to invest more in health to fulfill their duties. This results in longer recovery time in case of sickness, ergo longer sickness absence given same illnesses.
These more specific studies suggest that sickness absence is a good indicator for a visible health problem. which might yield interesting gender patterns in my empirical analyses.

2.6. Health Behavior as an Explanatory Factor

As mentioned in the discussion of the human capital model there are two main actors involved in the health selection process: employers and employees on the labor market. So far we have looked at the first actor and modified the human capital model from their perspective introducing gender biased subjective performance evaluation as a modifier of labor market rewards determination.
Now, we can take a closer look at the other actor, the employee. Do employees have something to contribute to the discussion of possible gender differences in health effects? I argue that they do. Their health behavior can be an important modifying factor in the human capital model. One main assumption which has been upheld so far will be challenged: Is health always

related to productivity? Especially a gender perspective makes room for doubt to this claim. In the following we will see why.

The starting point of the argument is an external health shock affecting a worker. What should now be under scrutiny is the worker's reaction towards this health shock. Two possibilities arise:

1. The worker can reduce her effort and/or working hours to deal with her health condition. This means accepting a (short-term) reduction of labor market rewards (with possible longterm consequences) in favor of a short-term improvement of the health status.

2. The worker can show the same amount of effort regardless of his health condition. This means accepting a (short-term) reduction of health (with possible long-term consequences) in favor of keeping the labor market rewards.

Which option the worker chooses depends on his preferences (for a related argument, see Johns 2010, Cropanzano, Rupp & Byrne 2003). Preferences for health come into play as well as preferences for career (to have a broad category encompassing preferences for labor income, working hours, etc).
Preferences are mostly generated through socialization processes as discussed in section 2.5.2. This highlights the role of the parents, school, and early adulthood for later life decisions on health related behavior (Hurrelmann 1994). The stronger the preference for health is, the higher the chance that the person chooses option 1. The higher the preference for career is the more likely the person is to choose option 2. It is important to note that these preferences should be seen in relation to each other. So the higher the preference for subjective health compared to the preference for career the more likely a person is to choose option 1.
In reality options 1 and 2 form a continuum. One pole represents complete focus on recovery, the other complete focus on the job, disregarding recovery. It follows that the higher the preference for career is - relative to preference for health - the more time and energy will be used for the job instead of recovering from a health shock.

If a person chooses to (partially) neglect recovery it can have different consequences. First, it is possible that she fully recovers despite the lack of focus on recovery. In this case one could say the person is lucky. Second, the person needs to borrow energy or health from future points in time or the person needs to externalize other non-labor-market efforts to other persons. Recovery will take longer. There might even be long-term negative health consequences. This can be directly visible or rather be a cumulative process (which might lead to burn-out or chronic conditions of mental or physical health).

2.6.1. Gender Differences in Health Behavior

The preferences for health and the respective health behavior do not vary randomly within the population. A lot of studies have shown that women put more emphasis on maintaining a healthy lifestyle and treating illnesses or mental problems with more care than men do (Dean 1989, Wickrama et al. 1999, Cockerham, Hinote & Abott 2006, Stefansdottir & Vilhjalmsson 2007). Men are often considered to be less reactive towards health problems. The problem is finding evidence not only for gender differences in preference for health, but for *health in relation to career*. Some empirical findings directly indicate that such particular gender differences exist.

Women see themselves as responsible for matters of health in the family, acquire more knowledge and follow through with the consequences (Faltermaier 2008, 41). Differences in health behavior as an explanatory factor for differences in sickness absence are not uncommon (Zok 2008, 119). Collins et al. (2005) find that women are more likely to be absent from work given a chronic health condition than men are. Self-reported impairment of work due to a chronic health condition was not gender sensitive. In a study by Fried, Melamed & Ben-David (2002) the results show that women are more susceptible to stress from noise than men are. In a study by Sandanger, Nygard, Brage & Tellnes (2000) women showed absolute higher prevalence of sickness absence given a mental health problems, but relatively to the prevalence of mental health problems a lower prevalence of sickness absence than men. This could either be interpreted as women reacting less to mental health problems or men recognize or report fewer mental health problems.

2.6.2. Consequences of Differences in Health Behavior on Health Effects

Let us say we accept the assumption that men have lower preference for health than women. It follows from the argument in section 2.6 that we should expect less reaction in form of recovery and at the expense of work effort from men than from women. If you do no adjust your effort after a health shock then your labor market success should not be affected. Labor market success becomes thereby invariant to health. The association between health and labor market success is reduced the stronger the preference for career is (relative to preference for health). Since men have a higher preference for career than women, their health should have a lower effect on their labor market success than women's health has.

I assume that there are no gender specific learning processes with growing age. I make this assumption to rule out the possibility that men and women adapt over time in their reactions to health behavior. The adaption could lead to a possible convergence of health behaviors or to a divergence depending on success and preferences. This assumption could be relaxed if age

specific analyses[10] were possible. However, the number of observations even in the SOEP is too small for such an analysis.

Again we can easily show a formalized version of the argument above. We simply assume that effort is only a function of health for women, but not for men:

$$e_f = e(H, E_{NLM}) \tag{2.15}$$

$$e_m = e(E_{NLM}) \perp H \tag{2.16}$$

Jumping to the calculation of marginal effects of effort on health we get for women:

$$\frac{1}{(e_f(H, E_{NLM}) * \tau_f)^{(1-\sigma)}} \alpha t \sigma \tag{2.17}$$

and for men:

$$\frac{1}{(e_m(E_{NLM}) * \tau_m)^{(1-\sigma)}} \alpha t \sigma \tag{2.18}$$

The equation shows that health does not play a role for LMR in the case of men, but it does for women. This is a theoretical conclusion that is matched by findings in the literature (McDonough & Amick 2001, 136).

2.7. Open and Closed Positions

So far I have used alterations of human capital theory to explain the link between health and labor market rewards. Now, I will turn to an area of the labor market where we have reached the limits of human capital theory and must take a new perspective to give sound theoretical background to the research question.

The question which arises is: What happens if there is no competition, no market mechanisms regulating labor supply? Is the link between health and labor market rewards the same? This part addresses the question where we should look for health selection and even more important, where *we should not* look. Asking these questions helps to locate health selection mechanisms and enables researchers to answer questions of health selection versus social causation more carefully.

Before I can answer the question I have to provide a complementary theory to human capital theory. I will use the sociological theory of open and closed positions. It is a major departure from classical thinking without discarding all the insights gained by human capital theory. I will

[10] E.g. through interaction-terms in the regression analysis or analyses of subgroups.

describe its foundations, assumptions, and conclusions about labor market processes. This lays the groundwork for answering the question about health and labor market rewards in open and closed positions.

2.7.1. Open and Closed Positions - Weber's Theory of Social Closure

The theory of open and closed positions has its roots in a more general theory of social closure that goes back to Max Weber. In his opus magnum *Economy and Society*, Weber (1976) distinguishes between open and closed social relations:

> "Eine soziale Beziehung (gleichviel ob Vergemeinschaftung oder Vergesellschaftung) soll nach außen 'offen' heißen, wenn und insoweit die Teilnahme an dem an ihrem Sinngehalt orientierten gegenseitigen sozialen Handeln, welches sie konstituiert, nach ihren geltenden Ordnungen niemand verwehrt wird, der dazu tatsächlich in der Lage und geneigt ist. Dagegen nach außen 'geschlossen' dann, insoweit und in dem Grade, als ihr Sinngehalt oder ihre geltenden Ordnungen die Teilnahme ausschließen oder beschränken oder an Bedingungen knüpfen." (Weber 1976, 23)

In this definition open relations are relations to which access is not regulated beyond the point that a person has to be able and willing to be part of the social relationship. A closed relation is one that regulates the access to a social relationship in a special way. The process of regulating and implementing restrictions to the access to social relationships is what is meant by *social closure* (Parkin 2003, 3).

Weber sees the development of closed social positions as a process which happens under different circumstances and in different societies. He claims that the desire to ward off contestants for a social position rises with the degree of competition. He argues that the main way of achieving closure is using an ascriptive characteristic like race or gender to exclude members of this group from access to the social position.

> "Mit wachsender Zahl der Konkurrenten im Verhältnis zum Erwerbsspielraum wächst hier das Interesse der an der Konkurrenz Beteiligten, diese irgendwie einzuschränken. Die Form, in der dies zu geschehen pflegt, ist die: daß irgendein äußerlich feststellbares Merkmal eines Teils der (aktuell oder potentiell) Mitkonkurrierenden: Rasse, Sprache, Konfession, örtliche oder soziale Herkunft, Abstammung, Wohnsitz usw. von den anderen zum Anlaß genommen wird, ihren Ausschluß vom Mitbewerb zu erstreben. Welches im Einzelfall dies Merkmal ist, bleibt gleichgültig: es wird jeweils an das nächste sich darbietende angeknüpft." (Weber 1976, 201)

Interestingly, we can find analogies to the theory of open and closed positions in Durkheim's (1922) work. He notes that the division of labor becomes anomic if the division of labor does not match the natural talents and skills of persons. He states that certain careers are completely *closed*[11] or harder to access for disadvantaged persons.

> " [...] grâce à la persistance de certains préjugés, une certaine faveur s'attache aux uns, une certaine défaveur aux autres, qui est indépendante de leurs mérites." (Durkheim 1922, 371)

With practices descended from the caste system as an example Durkheim states that due to prejudices certain people are evaluated with favor and others with disfavor. Important to note is that these evaluations are regardless of actual merit of the person. This claim very closely corresponds to the definition of *rent* given by Sørensen (1996). In Durkheimian terms rent arises if social inequalities do not exactly match natural inequalities. At this point we have to be careful with the analogy. Sørensen builds this theory of rent on a notion of rewards deviating from what they would be under perfect competition. We do not know exactly if perfect competition as a reference point for Sørensen is equal to natural inequalities which is Durkheim's point of reference for the evaluation of existing social inequalities.

2.7.2. Open and Closed Positions - Sørensen's theory

In this part I will explain the theory of open and closed positions or social closure on the labor market developed by Aage B. Sørensen (1983). As discussed above the theory is closely linked to the theory of segmented labor markets, which is a term used by Cain (1976) in his overview of challenges to neo-classical views on the labor market processes in the 1970s (for a short overview of segmented labor market theories, see section A.3 in the appendix).
Sometimes it is discussed as a sociological alternative to human capital theory. This is a bit misleading. The theory of open and closed position is rather pointing out the limitations of human capital theory and describes ways of determining labor market rewards where the assumptions of human capital theory do not hold. Sørensen (1983, 207) even explicitly points out the strengths of human capital theory:

> "For the open position scenario, this allocation process is well described in standard economic theory."

The intriguing feature about Sørensen's theory is that it is flexible enough to integrate theories of segmented labor market and neoclassical labor market theories without losing

[11] Durkheim uses the term *fermé*.

> "Même aujourd'hui et chez les peuples les plus cultivés, il y a des carrières qui sont ou totalement fermées, ou plus difficiles aux déshérités de la fortune." (Durkheim 1922, 372)

.

precision. In addition, it analyzes exactly those processes that are responsible for heterogeneous ways of wage determination on the labor market. How his theory is applied to the analysis of health selection is explained in the next section. Before health selection is addressed, I will give a brief outline of the theory of open and closed positions.

As the name indicates Weber's (1976) distinction between open and closed positions is at the heart of Sørensen's (1983) theory of open and closed positions[12]. Open positions are competitive jobs, closed are non-competitive jobs, possibly in internal labor markets. Closed positions are only available when vacated by the previous holder of the position. Unlike in closed positions, incumbents of open positions can be replaced at any time (Sørensen 1983, 206). These positions are not to be understood as a dichotomy, but as two poles of a continuum.
Sørensen's (1983) theory of open and closed positions on the labor market has several implications for the selection process of employees, because it leads to the question under which circumstances health selection is unlikely to be a driving factor of health inequalities.

In open positions market forces dictate reward of and access to jobs. Open positions are assumed to be unrelated to each other. They do not exist independently of their incumbents. A person holding an open position can be replaced at any time (Sørensen 1983, 206-207). Competition between employees is high, wages and all other benefits are derived exclusively from a worker's productivity. Employers choose their workers without interferences of institutional or legal regulation and treat workers as if they were exchangeable (Eliason 1995, 248).
This means that the occupancy of a positions does not grant the holder any benefits except what she gains through her productivity. The incumbent is in direct competition with other workers, unemployed, and non-employed as the matches between employer and employee are definite and usually short. Human capital theory aptly describes these processes of allocation to jobs on labor market (see section 2.4).

Closed positions on the other hand are not allocated as described by the human capital model. A human capital approach would suggest that a worker is paid according to her productivity which is determined by experience, education and the amount of effort she invests in her work (e.g. Becker 1985, Mincer 1974). In closed positions, however, payment and other rewards are linked to the *job* and not to the worker (Sørensen 1983, 211). This means that the incumbent of a certain position gets the same reward regardless of her performance on the job (Sørensen 1983, 209). It is also important to note that in closed positions incumbents can hold their positions as long as they want. The match between person and position is indefinite unless the incumbent chooses to leave. A new person can therefore only get into such a position if it has been voluntarily vacated. The mechanism of choosing a new incumbent is not based

[12]Weber (1976) uses open and closed position not only for the analysis of labor market positions, but all social positions. The focus in this thesis is on labor market positions.

on market mechanisms, but on authority decisions by an employer[13] which results in *career tournament* or *job competition* as described below (Sørensen 1983, 206). Closed positions are deeply embedded in relationship to other positions so that they exist independently of the persons in the positions.

> "[...] new matches cannot be established when changes in individual performance, or the availability of a candidate with qualifications believed to be superior to the incumbent, would make it desirable." (Sørensen 1983, 206)

It should not be concluded from the argument so far that there is no competition for closed positions. The contrary is true. There can be fierce competition for openings of jobs in a closed position. The outcome of an application process is interdependent on the performance of other contestants (possibly co-workers). Even if one receives extra training and shows more effort it might not be enough, because in a ranking one is still not the first. It is a winner-takes-it-all situation. The individual will therefore take the effort of others into account when deciding how much effort to spend himself (Sørensen 1983, 208-209). The other important difference is that the competition is over as soon as the vacancy is filled. Sometimes this kind of competition is referred to as *career tournament* (Inkson 2004). The notion of career tournament implies that persons within a firm compete for promotion at each step of hierarchy. One needs to win each round to progress to the next level. Those who are promoted early and have steadily been promoted have higher chances to get promoted even further than colleagues who have more unclear career trajectories (Rosenbaum 1979). The tournament model implies closed positions and vacancy chains as mechanisms of job allocation.
Related to the concept of open and closed positions is the distinction between *wage competition* and *job competition* proposed by Thurow (1975). As the name suggests in labor markets where wage competition is preeminent workers compete though wages, lowering them to get a job. In the job competition framework, wages are seen as fixed. Workers compete for vacant jobs. It presents a more general model than the career tournament model, because it can be applied to whole parts of the labor market, and not only to within-company promotions.

2.7.3. Reducing Supply, Increasing Demand - Mechanisms of Social Closure

I have described many of the differences between open and closed positions so far. What we do not know yet is how closure is achieved. For this purpose I will first present the two major mechanisms which bring about social closure. Second, I will give some examples of concrete strategies facilitating the mechanisms in the context of the labor market.

[13] Employer in the broadest sense. This can be a supervisor, head of Human Resources, or the actual owner of the business.

Social closure on the labor market (and on product markets as well) usually modifies either supply or demand, so that a state of equilibrium, as predicted by neoclassical economics, does not come about. It presents a kind of market imperfection. Closure strategies often try to limit the supply (of labor or products) so that - given constant demand - prices will go up and above the competitive price.
The other possibility is that closure strategies aim at increasing the demand for a certain asset (a product or labor) beyond the normal state it would reach in a perfectly competitive market. If supply is kept constant this leads to an increase in prices (wages)[14] (Weeden 2002).

On the labor market there are several general strategies to achieve reduction of supply or increase of demand. I will only mention one here, because it will be the base for an empirical measure of closure I use[15]. This strategy is professionalism and credentialism. In the appendix, I added the most common alternative strategies (A.2).

2.7.3.1. Credentialism and Professions

Weeden (2002, 61) defines credentialism as "[...] the use of familiar symbols or markers of knowledge (e.g., grad levels, diplomas) conferred by formal educational institutions to monitor entry into occupations." This definition picks up Weber's idea that the access to a certain social relationship (in this case a certain occupation) is restricted through educational titles or similar means regardless of the fact if somebody is capable of doing the job or not. Credentials are either seen as a formalized proof of ability to fulfill certain tasks or as arbitrary ways to join a particular group (Weeden 2002, 61).

An aspect similar to credentialism are professions. Abbott (1988, 7) concludes that most scholars agree that a profession is an occupation which requires a special, but abstract skill acquired through training. Dependent on different definitions of what drives professionalism, professions are either seen as a social group or as an occupational class. The latter case emphasizes external rewards to professions (Abbott 1988, 14). In addition professional organizations can lobby their own occupation to increase demand for their services or products and to advocate better working conditions (Weeden 2002, 65). They can also try to channel the demand for a certain service or product to their group by advocating that only they can deliver it (Weeden 2002, 66). It is a key aspect that expert knowledge of professionals makes it hard for consumers, the government, the public or other third party outsiders to assess the quality of work. This allows the extraction of a rent. In the empirical assessment of closure and

[14] Weeden (2002) argues that there are two additional mechanisms through which social closure influences outcomes. The one is channeling demand to the group and the other signals quality of service (Weeden 2002, 60). While this is a plausible argument I think these two additional mechanisms can be categorized as sub-mechanisms of increasing demand for the asset provided by the group. Going into detail is not necessary at this point. A simpler version of the argument serves just as well.

[15] Unionization might be the most important indicator of closure on the labor market in Germany. However the data set I use does not identify individual or employer bound unionization.

health effects one way of measuring closure will be knowledge intensity of occupational groups. This is not exactly the same as professionalism or credentialism, but is close to both concepts. It is an indicator for how easy or hard it is to assess the actual productivity of a worker in such an occupation. Also, it represents a reduction in supply of labor as a lot of workers are excluded from competition due to a lack of occupation or profession specific knowledge and skills.

2.8. Open and Closed Positions and Health

In the preceding section, I have used the theory of open and closed positions to argue that some positions on the labor market are not allocated by market mechanisms. In these closed positions human capital theory has only limited power of explanation. This section provides the link between open and closed positions and the theory of health selection. In the following sections the impact of social closure on the relationship between health and labor market rewards is further differentiated.

A relationship between labor market outcomes and health can so far only be established under the assumption that labor market outcomes, like wages or promotions, are awarded according to performance or productivity. The theory of social closure on the labor market suggests that sometimes jobs constitute non competitive positions. This means that productivity or performance is not the factor which decides whether some rewards are granted by the employer or not. Other factors like age or tenure might come into play, regardless of the actual company-specific human capital. For instance promotion to a high status job could occur not due to the good performance of a worker, but as a result of bureaucratic regulations[16]. These regulations state that a worker is designated for promotion at a certain time without a clear link to observed performance. If the rewards do not depend on the productivity, then it follows that they should be unrelated to health.

The two hypotheses which follow from this section are: In jobs with high potential for social closure (e.g. in the public sector) health does not affect the probability of job loss or high status attainment.

On the other hand, in jobs which are highly competitive (outside competition) health has a substantial influence on labor market outcomes.

A formalization of the argument would give two options. In a fully closed position the original model we were using

$$LMR = \alpha \epsilon^{\sigma} t \tag{2.19}$$

[16] in the labor contract, laws for civil-servants, or collective agreement.

would transform to:

$$LMR = \alpha\epsilon^{0}t \tag{2.20}$$

In this case labor market rewards are determined regardless of effort. The effort intensity is reduced to zero. If we allow for a more continuous view on closure we can introduce a factor which represents the openness of a job, meaning an inverted scale of the social closure factor c. If c takes the value 0 the position is completely closed. If it takes the value 1 it is completely open.

$$LMR = \alpha\epsilon^{\sigma * c}t \tag{2.21}$$

Deriving the marginal effect of health on labor market rewards we get:

$$c * \sigma\epsilon^{(\sigma * c-1)}\alpha t = c * \sigma\frac{1}{(e(H, E_{NLM}) * \tau)^{(1-\sigma * c)}}\alpha t \tag{2.22}$$

Here we can clearly see that if c takes the value 0 the marginal effect of effort and therefore of health will be zero as well. The higher the value of c the stronger the effect of effort, and in consequence health, on labor market rewards. The formula therefore leads to the same conclusion as the intuitive argument: The more closed a position is the smaller should be the impact of health on labor market rewards.

2.8.1. Open and Closed Positions: Incumbents vs. Applicants

I have treated the relationship between health and labor market rewards as if labor market rewards can be awarded in a continuous way like wages. However for high status jobs this assumption does not hold. It might be true that the probability of attaining such a position can be altered continuously with regard to health status. The question whether one does or does not get a reward cannot be defined in such a way. One cannot get a promotion just a bit or a little bit more. It's all or nothing.

2.8.1.1. How the Choice of Labor Market Outcome Affects the Role of Health

A distinction can be made between the classical measure of labor market generated income which is continuous and a dichotomous reward like a high status job[17]. Such a distinction only makes sense if we expect a non-perfect market. If all jobs were completely open than the distinction between high and low status jobs would be irrelevant as all relevant information about the importance or value of a job would be included in the wages. However, if we accept

[17]Which is of course often associated with an increase in wages, but not necessarily and the degree to which it is varies a lot.

that some jobs (especially high status jobs) cannot just be created and eliminated at will, then a decision to give such a position to a person implies uncertainty and risk for the employer. In open positions hiring someone is not a risk for the employer, because he can fire the person at any time.

High status jobs can be seen as closed positions, because they provide important functions, supervision, and expert knowledge. All of these cannot simply be created and abolished anytime the employer wants. Other jobs in companies depend on these jobs. Incumbents have strong bargaining position, because of the importance of the position. Hiring someone in a closed position involves the risk of hiring someone who is not up to the task which is contrary to employers' preference for maximizing profit. This is especially problematic as the candidates for a job will highlight their strengths and try to hide their weaknesses (Williamson 1973, 319). Such a strategy improves their bargaining position as applicants. Of special relevance is this behavior in fields and for positions where productivity cannot directly be measured and employers need to look for indirect signs of quality in the applicant. Not all candidates might overstate their potential usefulness to the employer. Nevertheless, it is sufficient to assume that *some* persons will act opportunistic in such a situation to warrant uncertainty for the employer (Williamson 1981, 553). The employer can never be sure, that the person under review is actually capable of doing what he claims. Therefore special attention will be paid to supposed signals of performance. That encourages statistical discrimination, which in turn facilitates gender differences in health effects (Sørensen 1983, 210).

Analyzing job status also allows to distinguish between the position of the applicant and the incumbent and how this modifies the role of health (section 2.8.1.2). As I will argue below it makes a systematical difference whether one applies for a high status job, or whether one already occupies such a position. The latter is much more to the benefit of the employee.

2.8.1.2. Incumbents vs. Applicants

If we accept the argument that incumbents and applicants have a structurally different bargaining position, we can raise another question. Does it make a difference for the role of health if I want to attain a position or if I want to keep it? At first thought one might think that the mechanisms should be the same. Highly productive workers get the job, workers with low productivity lose it. End of story. However, the preceding sections about different mechanisms of allocation and rewards in open and closed positions warrant a further investigation into the matter.

Regarding health effects, I argue that it is necessary to make a distinction between the role of an incumbent and an applicant. In the following, I will explain why and how this allows me to formulate more precise hypotheses.

I assume that employers have a preference to reduce risk of productivity loss. This preference

is higher than the preference for maximizing profit in the long run, as most employers[18] cannot or are not willing to risk short-term productivity losses which might arise from incompetent employees in important positions. Most employers cannot try out 5, 10, or even more employees for a job until they find the perfect match. The backside of the coin is that they might hire on average lower performing employees, but with less variance in performance. Assessment centers are a way of circumventing this problem to some degree. But an assessment center also presents a large investment on the side of the employer and requires a lot of know-how to be effective. A lot of employers might not be able to handle this. Given employers' preference to reduce risks it seems plausible that selection criteria for open positions are less strict than for closed positions. In open positions hiring an unproductive employee can be corrected after a short period of time, in closed positions this is by definition very hard as the match is indefinite (Sørensen 1983, 209).

Therefore health should play a minor role in getting into jobs in open positions. Employers do not need strong signals of high performance, because they can easily get rid of employees who are ill and show low performance. The other side of the argument is that if you are occupying an open position, health is of major importance. Employers can replace you at any time, so reduced performance will be penalized immediately.

For closed positions the argument goes the other way around. The criteria for entry into a position are also an indicator of the openness of a position. So, if demands in form of e.g. diplomas, tests, work experience, and most important for my example physical fitness are high then the position has a high degree of closure (Doeringer & Piore 1985, 47). This suggests that health is very important when applying for a job in a closed position. The importance of health in the application process can further be supported by job search models. In this view workers have to make an investment in their search (usually in form of reduced income). If they are ill their search will be less effective, raising opportunity costs and reducing the chance of finding a good job. This includes the application for promotion. It will also reduce their performance in interviews or other forms of assessment (Paul & Moser 2009, 268). They will have less energy for preparation or to look for alternatives. They might be in a worse position for negotiations as well.

We can therefore view applying workers as being in a situation of *career tournament* (Rosenbaum 1979) or *job competition* (Thurow 1975). They need to show the absolute highest performance to get the job. They will have to take the performance of others into account, because it will influence their own ranking in the view of the possible employer. This makes it very important that they are in good health. However, once occupying a closed position performance and rewards of the incumbent are detached. Job loss, pay cuts, and demotions are a minor risk. Therefore the performance they show does not need to be high. They have no further need to be ranked as number one. This makes it less important that they are completely fit. Illnesses can be easier compensated, and consequently health is of little importance to the question of

[18] Who lead medium and small businesses.

whether they keep their position or not.

The last point has to be differentiated. If the person occupying a closed position has aspirations to move further up the job ladder, things look different. Even if further aspirations exist, job loss and pay should still be detached from health. But if another promotion or a better job is desired, then incumbents of closed positions find themselves again in a job competition or career tournament and the process starts again only this time with different contestants. This potential for climbing the ladder within a firm or bureaucracy has been argued to be one of the strongest incentives for high performance that employers can use for employees in closed positions (Sørensen 1983, 211). In addition, such incentives based on seniority promotions can be efficient for employers if they fear costs of labor turnover (Carmichael 1983). One might even expect that the higher on the career ladder a person enters such a tournament the more important personal health is, because the fiercer the competition for the ever reduced number of closed positions will be. Such a mechanism can be superimposed if social contacts, not performance is the main criterion for ranking. The literature reports that social contacts are an important factor for the highest of managerial positions. Then a strategic position in the *old boy networks* (Oakley 2000) is more important than physical or mental health.
In conclusion, we can say that health is important if you want to get **into** a closed position (applicant) - regardless of whether you are in an open or closed position at the moment. The important part is that you enter the competition for a position. Health is also important if you want to keep a job in an open position (incumbent). On the other hand health is of no consequence if you want to attain an open position or want to keep a job in a closed position (see table 2.1 for a schematic overview).

2.8.1.3. Open and Closed Positions and Discriminated Groups

The theory of open and closed positions can be further modified allowing for disadvantaged groups. For this purpose, I make a distinction between the degree of closure of a position towards different groups. The distinction between applicant and incumbent will also be upheld. Discrimination increases the degree of closure of a position for a certain group if they try to get into such a position (applicant). This corresponds to an argument made already by scholars from segmented labor market theory. One way of discrimination in closed positions is entry discrimination. Hiring standards, screening criteria, and recruitment practices can be used to directly or most often indirectly select the discriminated from the main group (Doeringer & Piore 1985, 137-140).
However, once in the position, it will be less closed, because the employer has reduced opportunity costs of firing the incumbent as long as he or she has a taste for discrimination against the incumbent. The argument holds for employers with a taste for discrimination, because this taste should persist after employing a disadvantaged person. If discrimination

Table 2.1.: Expected Effect of Health Depending on the Type of Labor Market Position

Status of individual	Applicant	Incumbent
Type of labor market position		
Open	no	yes
Closed	yes	no

Table 2.2.: Change of the Degree of Closure of a Labor Market Position Depending on Discrimination

	Discrimination	no Discrimination
Incumbent	more open/none	none
Applicant	more closed	none

does not persist the position of the incumbent is not influenced. This shows that it makes a difference whether statistical discrimination is the relevant mechanism. If it is, discrimination is expected to vanish after hiring, because then the employer can assess the individual and does not have to draw on averaged information from the individual's group. In the case of taste for discrimination the taste should persist and so should the discriminatory practice (see table 2.2 for a schematic overview).

We can conceptualize this as the overlaying of two processes of social closure. Discrimination is one. The other is a not nearer defined process of job closure. This can be an occupational closure mechanism as described in section 2.7.3 or a high status job, which is closed due to its high degree of specialization and responsibility involved. The two processes of social closure reinforce each other.

On the other hand, membership in a discriminated group means that certain positions are closed against the discriminated individual. When occupying such a position (e.g. a high status job) it is *less* closed for all other non-discriminated persons, because, as mentioned above, employers have reduced opportunity costs of firing such a person.

Here we can refer back to the argument that women have a harder time getting into a high status job than men. They have to compensate the fact that they are discriminated against by showing more effort to get into a closed position. In addition, when occupying a high status job, health is more important for women, because they are more likely to lose their position again.

2.8.2. The Benefits of the Theory of Open and Closed Positions for a Theory of Health Selection

At this point, I will briefly review how the theory of open and closed position enriches a theory of health selection. My argument will be on two levels. First, I will make a general comment on the usefulness of contextualizing health selection theory. Second, I will briefly review the

concrete hypotheses derived from a combination of the theory of open and closed positions and health selection theory.

The theory of health selection states that employers select healthy workers to receive higher labor market rewards, because they are more productive. This assumes that there is competition between workers for jobs and between employers for productive workers. The theory of open and closed positions now proposes that not all social positions are competitive. In fact, closed position are exempt from competition. If there is no competition employers lose their ability for selection according to productivity criteria. Workers' health can therefore no longer be a selection criterion. This results in the fact that *within* closed positions health inequalities cannot be generated through health selection processes. Still there can be the chance for selection *between* open and closed positions. Health inequalities between open and closed positions can therefore be potentially explained by health selection.
The theory of open and closed positions is therefore useful to highlight in which areas of society or specifically of the labor market we can expect health selection processes to take place and where we would **not** expect them.

In addition to this more general benefit, there are several theoretical propositions developed that apply to the labor market. We expect that health should not be a selective factor for high status jobs in closed positions. In the empirical example this will be exemplified with a differentiation between public and private sector, professionalized (knowledge intensive) occupations, and male vs. female dominated occupations.
Selection processes play a role when workers try to attain a high status job, but health should be of lesser importance when retaining such a position. Such a differentiated hypothesis could not have been derived from the basic theory of selection only based on Becker's effort model. Last, considering discriminatory practices as a form of social closure overlaying and modifying other existing forms of closure leads to the hypothesis, that women might actually be selected out of high status while men are not. Women face the risk of being selected out, because taste for discrimination lowers opportunity costs of lay-offs for employers. On the other hand men might face health selection while trying to attain a high status job to a lesser degree than women do.

As I did several times before in the theory part, I let a formalized version follow the intuitive argument. The formal equation of the health selection theory was:

$$LMR = \alpha\epsilon^{\sigma * c}t \tag{2.23}$$

Status of applicant and incumbent is not yet considered. Neither is the interaction of closure and discrimination. Recall that c stands for the degree of openness of a job, ranging between 0 (closed) and 1 (open). Now we introduce the interaction of status of applicant (A) into the equation. A takes the value 1 if the person is an applicant and 0 if the person is an incumbent.

$$LMR = \alpha\epsilon^{\sigma*|A-c|}t, A \in \{0,1\} \tag{2.24}$$

This formulation makes effort very important for applicants if the position is very closed (e.g. $|1-0.1| = 0.9$) and unimportant if the person already holds the position ($|0-0.1| = 0.1$). The opposite is true if the position is open. Now it is only a simple step to introduce discrimination (d) as a modifying factor of closure.

$$LMR = \alpha\epsilon^{\sigma*|A-c*d|}t, 1 \geq d \leq \frac{1}{c} \tag{2.25}$$

The last equation shows that the higher the discrimination is the more open a position is as an incumbent, and the more closed it is as an applicant.

Another field for interesting applications of closure theories is research on health inequalities related to educational attainment. Here the focus would be on the extend in which school, university, apprenticeship, or other forms of institutionalized education can develop selective mechanism which are related to the performance of young persons in these institutions. This performance could then be linked to their health status, so that health inequalities generated by health selection seem to be very plausible in this context. Certain educational institutions are subject to more or less social closure, so that a heterogeneity in the selective function of health for educational attainment could be expected.
We can see that the limits of what kind of research could be stimulated by a combination of the health selection theory and the theory of open and closed positions have not nearly been reached in this thesis.

2.9. Summary, Assumptions and Hypotheses

2.9.1. Summary and Hypotheses

In this part, I will sum up the arguments made so far. I put a special emphasis on highlighting the assumptions underlying the theory and I list them separately with reference to the sections where they are elaborated.

The theoretical developments aim to explain how structural determinants modify micro-mechanisms of health selection on the labor market. I build on an effort and labor market rewards model by Gary Becker which implies that labor market rewards are awarded according to productivity and that effort has a decreasing return on productivity (Assumption 2 & 3). I expand the theory by arguing that effort in the model is a function of health (Assumption 1). Paying employees only up to their productivity is a rational behavior of employers in a functioning labor market under the implicit assumption that employers want to maximize their profit (Assumption 4).
Concluding from the assumptions 1-4 we can state the first hypothesis which motivates the whole study:

H1: Health influences labor market rewards. In consequence, better health increases the chance of high job status attainment.

In evaluating the productivity of a worker, employers are biased towards underrating women's performance compared to men's (Assumption 5). Further, I assumed that men and women have different preferences for health in relation to career (Assumption 7) and that workers adjust their effort at work after a health shock dependent on this relation (Assumption 6). Given higher preference for health in relation to career among women I deduct that women are more reactive to health shocks in reducing effort at work than men. I also state the auxiliary assumption that there are no gender specific learning processes in effort adjustment after health shocks (Assumption 10). Another way of testing the general health selection hypothesis is to see if the effect of a negative health status gets stronger the longer the person is within this state, because longer periods of bad health are harder to compensate (Assumption 16). The respective hypotheses are:

H2a: Health has a stronger influence on labor market rewards for women than for men. The effect of health on the chance of high job status attainment is stronger for women than for men.

H2b: The longer a negative health condition lasts, the stronger the impact is on job status.

I assume that employers also have a preference for risk avoidance which outweighs the preference for profit maximization (Assumption 8). Drawing on the theory of open and closed positions, I propose that the higher the degree of social closure, the higher is the employers risk when employing someone with at least partly unknown productivity (Assumption 9).
High status jobs are positions with a high degree of social closure, which in turn constrains demotions and layoffs (Assumption 11). Jobs in the public sector (especially high status jobs) are treated as fully closed positions (Assumption 12). Taking into account the employers' tendency for risk avoidance health is of greater importance for applicants to closed positions and for incumbents of open positions. The following hypotheses are derived:

H4: The chance of dropping out of a high status job is not related to health.

H5: In the public sector health does not affect the chance of high status job attainment.

For women as a disadvantaged group a social position is reduced in its degree of closure if the person is an incumbent and the degree of closure is increased if the person is an applicant (Assumption 13). This leads to a hypothesis that is in explicit competition to hypothesis 4:

H6: Dropping out of a high status job is related to women's health, but not to men's health.

It is expected that high degrees of closure lead to decreasing importance of health for job status. This is exemplified with the degree of knowledge intensity of occupations as an occupational closure mechanism. Two further hypotheses can be formulated with respect to social closure in occupations and health selection. In occupations with a high degree of gender specific closure two alternative hypotheses arise. The homohily-hypothesis is based on the assumption that homophily exists in female dominated occupations (Assumption 14a). The alternative hypothesis (glass-escalator hypothesis) rests on the assumption that there is a "glass-escalator" effect for men in female dominated occupations (Assumption 14b).

H7a: The higher the degree of knowledge intensity, the lower the effect of health on job status.

H7b: Women's health is less important for high status job attainment in female dominated occupations than in mixed or male dominated occupations.

H7c: Men's health is less important for high status job attainment in female dominated occupations than in mixed or male dominated occupations.

The last hypothesis refers to a different way of measuring health. It states that for the employer visible health problems might follow a different logic, because consequences for productivity are easier to judge for an employer. Specifically, I postulate that the days of sickness absence are easy to monitor. Given a male culture of presenteeism (Assumption 15) days of sickness absence should have more negative effects for men than for women, contrary to the pattern of effects of general health.

H8: The effect of the number of days of sickness absence on the chance of high status job attainment is stronger for men than for women.

The preceding hypotheses are all modifications of the general health selection hypothesis. Social causation pathways and mechanisms are not discussed in detail in the theory chapter. However, at a later stage of the empirical analyses I will test social causation mechanisms as well. The respective hypotheses are:

H9a: Incumbents of high status jobs have better health due to higher resources, better employment and working conditions.

H9b: Incumbents of high status jobs have better health due to social-psychological factors like fear of job loss and satisfaction with work.

H9c: Incumbents of high status jobs have better health, which has to be attributed to common background factors leading to spurious correlation.

H9d: Incumbents of high status jobs have better health, which cannot be explained by health selection, resources and working conditions, and background factors. This is a social status effect on health.

2.9.2. Set of Assumptions

Assumption 1: The effort a person can show at work depends on the person's health. In this sense effort is an (unknown) positive function of health (section 2.4.2).

Assumption 2: Labor market rewards are awarded according to perceived productivity. Perceived productivity is determined by human capital, *perceived* effort, effort-intensity of the job, and work hours (section 2.4.2). High job status is seen as a labor market reward.

Assumption 3: Effort has a decreasing return on productivity (section 2.4.3).

Assumption 4: Employers want to maximize their profit (section 2.5.1).

Assumption 5: Employers perceive a certain amount of effort made by a woman as less than the same amount of effort made by a man (section 2.5.2).

Assumption 6: All individuals have a known preference for health and career. The adjustment of effort at work depends on the relation of the preference for health and work (section 2.6).

Assumption 7: Women have relatively higher preferences for health in relation to career than men (section 2.6.1).

Assumption 8: Employers' preference for risk avoidance is higher than their preference for profit maximization (section 2.8.1).

Assumption 9: The more a job is subject to social closure the higher is the employer's risk when hiring someone for the job (section 2.8.1).

Assumption 10: There is no gender specific learning process in dealing with health shocks (section 2.6.1).

Assumption 11: High status jobs are subject to social closure. Employers cannot create and abolish these positions (which means promoting or demoting an employee) at any given time nor can they hire or fire their incumbents at will. High status jobs are not completely closed positions either. That means that promotions, demotions and layoffs are still possible, but are constrained (section 2.8).

Assumption 12: In the public sector high status jobs are fully closed positions where Assumption 11 does not hold (section 2.8).

Assumption 13: Members of disadvantaged groups experience modified degrees of social closure of positions. As an incumbent the position is more open, as an applicant the position is more closed (section 2.8.1.2).

Assumption 14a: There is gender specific homophily within occupations (section 2.5.2).

Assumption 14b: Men in female dominated occupations have an exceptional status, allowing them to reach high job status more easily (section 2.5.2).

Assumption 15: Men are subject to a culture of presenteeism at work which requires them to be present at work even when they are ill. Deviations from this norm are sanctioned (section 2.5.4).

Assumption 16: Longer periods of bad health are harder to compensate than short periods (section 2.4.2).

3. Review of the Empirical Literature

3.1. Overview and Development of a "Good Practice" Approach

In this part of the dissertation, I will review the empirical literature which tries to test the health selection hypothesis. Studies from the fields of medical sociology, public health, medical psychology, health economics and epidemiology are taken into account.
This review is not exhaustive, but still captures the most important literature. It includes a large table listing all studies discussed with several relevant criteria as an overview.

For this review I searched for studies dealing with the health selection hypothesis. In addition, I looked for economic literature which does not use the term, but still estimates effects of health on labor market outcomes. I restricted my search to labor market outcomes and socio-economic status (SES) as the dependent variables. In other areas health selection might also be present (marriage, educational attainment, migration, residential mobility, etc.), but due to a necessary reduction of complexity I will focus only on labor market and SES.

Overall, my search lead to a total of 76 studies, which claim that they test the health selection hypothesis. First, we can take a look at the range of outcomes the literature dealt with. Most of the studies use unemployment (19), or employment (15) as an outcome. Another big part of the literature (mostly from economics) focuses partly or entirely on wages (17). 14 studies dealt with occupation or occupational classes and 8 studies with household income. The other studies had different (additional) dependent variables in their study design. Among them are for example financial strain, wealth, hours worked, job loss, tenure, or temporary employment.
22 studies used a measure of SES, though it is not always measured in the same way. A lot of studies relied on occupational classifications or household income, sometimes supplemented by educational attainment.

I also looked at how health is measured. The most frequently used indicator of health (28) is self-rated health or subjective health (SRH). A lot of studies refer to the standard 5-point-scale SRH question, but not all do so.

Mental health is the specific aspect of health, which is used most often in the literature (20). However, under the umbrella term of mental health there the studies employ a wide range of mental problems and measures as their outcomes. This ranges from depression and mood to mental health from the SF-12 score. Assorted physical symptoms (13) or specific diseases (4) are widely used as well. What is true for mental health is true here as well. No standardized measure was used. Another block of the literature asked for limitations in every day or work activities or physical mobility (11). Other health measure that are used are hospitalization (4), accidents or injuries (3), and sickness absence (5). A topic on its own is the literature on differentials in mortality. Most studies in mortality do not discuss the health selection issue. Those who do (8) cannot, for obvious reasons, use mortality as a predictor of labor market outcomes or SES. It is rather several indirect ways in which they try to assess health selection, arguing that negative labor market outcomes and mortality might both be influenced by bad health prior to death.

It is also of interest to look in which country the studies are conducted. The country presents the context of the labor market and the general level of competitiveness and solidarity in the society. Not surprisingly given the size and scientific impact, we can see that most studies are conducted in the United States (23). After the US the Scandinavian countries and Finland are clearly overrepresented given their modest size (SE 10, NO 8, FI 6, DK 1). The reason is probably that the issue of health inequalities is considered to be very important in these countries. Researchers also have access to register data as in almost no other countries, which explains the huge number of observations in their studies. A lot of studies are done in the United Kingdom (12), in Germany there are 5, same as in the Netherlands. The other studies are conducted in various European countries, Canada, and Australia. Regarding data sets, all German studies used the SOEP, and several of the UK studies used the British Household Panel Study (BHPS) which is fairly similar to the SOEP in design.

One other important feature is whether studies directly tested health selection or whether they inferred its existence or absence indirectly. Most studies conduct direct tests of the health selection hypothesis (59). 32 studies claim to assess health selection versus social causation, although not all studies conduct a direct test of this causal relationship.
I propose that a "**good practice**" approach would be to assess both hypotheses in one study, and conduct a direct test of both hypotheses. There are 20 studies which fulfill the "good practice" standard. As the "good practice" studies are the core studies in the field, I will go into more detail to describe each of them.

Table 3.1.: Overview of Studies Involving Health Selection

Study	Year	HS	DT	VS	NumbObs	Country	SES	LM Measure	SRH	Health Measure	Econ	Journal	Age	Long	GP
Aittomäki, Martikainen, Laaksonen, Lahelma & Rahkonen (2012)	2012	yes	yes	yes	211,639	FI	yes	unemploment,wages	no	sickness absence	no	SSM	17-66	yes	yes
Arrow (1996)	1996	yes	yes	no	yes	DE	no	unemployment	no	sickness leave, chronic disability	no	SSM	18-64	yes	no
Bartel & Taubman (1979)	1979	yes	yes	no	5000	US	no	wages	no	diseases, symptoms	yes	TRES			no
Bartley (1991)	1991	no	no	no	500000	GB	no	unemployment	no	mortality	no	JSP	15-64	yes	no
Baum & Ford (2004)	2004	yes	yes	no	12000	US	no	wages	no	obesity	yes	HE	14-40	yes	no
Berkowitz & Johnson (1974)	1974	yes	yes	no	900	US	no	wages	no	limitations	yes	JHR	25-64	no	no
Black, Devereux & Salvanes (2005)	2005	yes	yes	no	5000	NO	no	wages	no	birthweight	yes	NBER	16-74	yes	no
Böckerman & Ilmakunnas (2009)	2009	yes	yes	yes	19206	FI	no	unemployment	yes	no	yes	HE		yes	yes
Buddelmeyer & Cai (2009)	2009	yes	yes	yes	1769	AUS	no	Income	poverty	yes	yes	IZA	18-64	yes	yes
Burgard, Brand & House (2007)	2007	yes	no	no	6115	US	no	jobloss	yes	depression	yes	JHSB	15-35	yes	no
Cai & Kalb (2006)	2006	yes	yes	yes	9000	AUS	no	employment	yes	no	yes	HE	15-64	yes	yes
Cai (2010)	2010	yes	yes	yes	4669	AUS	no	employment	yes		yes	LE	25-64	yes	yes
Cardano, Costa & Demaria (2004)	2004	yes	yes	no	127384	IT	yes	occ. classes, MIOM scale, unemployment, non-employment	no	hospitalization	no	SSM	25-49	yes	no
Carlsen, Dalton, Diderichsen & Johansen (2008)	2008	yes	yes	no	380000	DK	no	unemployment	no	cancer survivor	no	EJoC	10-60	yes	no
Chandola et al. (2003)	2003	yes	yes	yes	10308	UK	no	employment grade, financial deprivation	no	physical, mental	no	SSM	35-67	yes	yes

Table 3.1 – *Continued from previous page*

Claussen, Bjørndal & Hjort (1993)	1993	yes	yes	yes	5000	NO	no	unemployment	no	mental health	no	JECH	16-70	yes	yes
Contoyannis & Rice (2001)	2001	yes	yes	no	1296	US	no	wages	yes	mental health	yes	EE		yes	no
Crichton, Stillman & Hyslop (2010)	2011	yes	yes	no	85390	US	no	employment, wages	no	injury	yes	ILRR	15-69	yes	no
Dahl (1993a)	1993	yes	no	yes	2200000	NO	yes	occupation	no	mortality	no	EJPH	20-64	yes	no
Dahl (1993b)	1993	yes	no	no	420000	NO	no	occupations	no	mortality	no	JECH	20-64	yes	no
Dahl & Kjærsgaard (1993)	1993	yes	no	no	2215	NO	no	employment, occupation	no	mortality limitations	no	SSM	25-66	yes	no
Duguet & Le Clainche (2012)	2012	yes	yes	no	3618	FR	no	job loss, employment	no	chronic illnesses accidents	yes	LAMETA	19-59	yes	no
Eaton, Muntaner, Bovasso & Smith (2001)	2001	no	yes	yes	907	US	yes	labor/HH-income, job percentiles, social benefits	no	depression	no	JHSB	16-64	yes	yes
Elstad & Krokstad (2003)	2003	yes	yes	yes	9189	NO	no	occ. class	yes	no	no	SSM	25-59	yes	yes
Elovainio, Ferrie, Singh-Manoux, Shipley, Batty, Head, Hamer, Jokela, Virtanen, Brunner, Marmot & Kivimäki (2011)	2011	yes	yes	yes	8312	UK	yes	employment grade, promotion	no	cardiometabolic biomarkers, childhood hospitalization, birth weight	no	AJE		yes	yes
Ettner, Frank & Kessler (1997)	1997	yes	yes	no	4626	US	no	wages,employment, hours of work	no	psychatric disorders	yes	NBER	18+	no	no
Fox, Goldblatt & Jones (1985)	1985	no	no	yes	500000	GB	yes	no	no	mortality	no	JECH	15-64	yes	no
Fox (1990)	1990	no	no	no		US	yes	no	no	mental illness	no	JHSB			no
Frijters, Johnston & Shields (2010)	2010	yes	yes	no	35000	AUS	no	employment	no	mental health SF36	yes	IZA	22-64	yes	no
Gambin (2005)	2005	yes	yes	no	200000	EU	no	wages	yes	chronic illness	yes	HEDG		yes	no
García-Gómez, Jones & Rice (2010)	2010	yes	yes	no	5500	GB	no	employment	yes	limitations	yes	LE	16-59	yes	no
Haan & Myck (2009)	2009	yes	yes	yes	4420	DE	no	employment	yes	no	yes	JHE	30-59	yes	yes

Table 3.1 – *Continued from previous page*

Haas (2006)	2006	yes	yes	no	2805	US	yes	wages, wealth, occupation	no	birthweight	no	JHSB	16-64	yes	no
Haas, Glymour & Berkman (2011)	2011	yes	yes	no	6155	US	no	wages	yes	childhood health	no	JHSB	25-50	yes	no
Halleröd & Gustafsson (2011)	2011	yes	yes	yes	2976	SE	yes	SIOPS, HH-income	no	limitations diseases	no	SSM	31-63	yes	yes
Hammarström & Janlert (2005)	2005	yes	yes	no	1083	SE	yes	blue collar	no	weight smoking alcohol etc.	no	SSM	16-30	yes	no
Harkey, Miles & Rushing (1976)	1976	yes	no	yes	16569	US	no	HH-income	no	limitations	no	JHSB	6-65	no	no
Haveman, Wolfe, Kreider & Stone (1994)	1994	yes	yes	yes	4640	US	no	wages, hours of work	no	limitations	yes	JHE	25-65	yes	yes
Heponiemi, Elovainio, Manderbacka, Aalto, Kivimäki & Keskimäki (2007)	2007	yes	yes	yes	90000	FI	no	unemployment	no	mental health sympotoms digestive sytsem	no	JPR	20-45	yes	yes
Hofoss, Dahl, Elstad & Cvancarova (2012)	2012	no	no	no	2261076	NO	no	income deciles	no	mortality	no	EJPH	25-66	yes	no
Huurre, Rahkonen, Komulainen & Aro (2005)	2005	yes	yes	yes	1262	FI	yes	occupation, education	no	psychosomatic distress	no	SPPE	16-32	yes	yes
Jäckle & Himmler (2010)	2010	yes	yes	no	14100	DE	no	wages	yes	no	yes	JHR	18-65	yes	no
Jones, Rice & Roberts (2010)	2010	yes	yes	no	1135	GB	no	retirement	yes	limitations	yes	EM	50-65	yes	no
Jusot, Khlat, Rochereau & Serme (2008)	2008	yes	yes	no	5807	FR	no	unemployment	yes	obesity smoking	no	JECH	30-54	yes	no
Ki, Sacker, Kelly & Nazroo (2011)	2011	yes	yes	no	7171	GB	yes	employment	yes	no	no	JECH	30-64	yes	no
Kivimäki, Vahtera, Elovainio, Pentti & Virtanen (2003)	2003	yes	yes	no	886	FI	no	employment	yes	mental symptoms sickness	no	AJCP		yes	no

Table 3.1 – *Continued from previous page*

Klein-Hesselink & Spruit (1992)	1992	yes	no	yes	1000	NL	yes	unemployment, education, occupation, HH-income	no	chronic illness, symptoms, depression	no	IJE	30-50	yes	no
Koskela, Luoma & Hernberg (1976)	1976	yes	yes	no	1789	FI	no	turnover	no	diseases symptoms	no	SJWEH	15-74	no	no
Lawrence (1948)	1948	yes	no	yes	1010	US	yes	subjective class	no	chronic illness	no			yes	no
Lee (1982)	1982	yes	yes	yes	2800	US	no	wages	yes	limitations	yes	IER	45-59	yes	yes
Leino-Arjas, Liira, Mutanen, Malmivaara & Matikainen (1999)	1999	yes	yes	no	586	FI	no	unemployment	no	mental health health behavior	no	BMJ	40-59	yes	no
Lichtenstein, Harris, Pedersen & McClearn (1992)	1992	yes	no	yes	758	SE	yes	occupation, education, material resources	yes	chronic illness	no	SSM	26-87	no	no
Lundberg (1991)	1991	no	yes	no	2957	SE	yes	occupation	no	symptoms, abscence	no	ESR	20-64	yes	no
Lundborg, Nilsson & Vikström (2011)	2011	yes	yes	no	1100000	SE	no	wages	no	hospitalization	yes	IZA	30-59	yes	no
Lundin, Lundberg, Hallsten, Ottosson & Hemmingsson (2010)	2010	yes	no	yes	49321	SE	no	unemployment	no	mortality	no	JECH	20-54	yes	no
Magee (2004)	2004	yes	yes	no	19000	CA	no	jobloss	no	illness, disability	no	SSM	16-69	yes	no
Manor, Matthews & Power (2003)	2003	yes	no	yes	11405	UK	yes	occupation	yes	absence	no	SSM	23-33	yes	no
Mastekaasa (1996)	1996	yes	yes	no	2119	NO	no	unemployment	no	mental health (chronic) illness	no	JCASP		yes	no
McDonough & Amick (2001)	2001	yes	yes	no	5378	US	no	employment	yes	no	no	SSM			no
Meerding, IJzelenberg, Koopmanschap, Severens & Burdorf (2005)	2005	yes	yes	no	560	NL	no	productivity	yes	eq5d pcs-12 mcs-12 mental symptoms	no	JCE		no	no
Montgomery, Bartley, Cook & Wadsworth (1996)	1996	yes	yes	no	2256	GB	no	unemployment	no	height, social adjustment	no	JECH	22-32	yes	no
Mulatu & Schooler (2002)	2002	yes	yes	yes	705	US	yes	HH-income, education, occupation		distress, sleep	no	JHSB	41-88	yes	yes

Table 3.1 – *Continued from previous page*

Mullahy & Sindelar (1991)	1991	yes	yes	no	4800	US	no	wages, employment, HH-income	no	alcoholism	yes	TAER	30-59	no	no
Ostlin (1988)	1988	yes	no	no	10800	SE	no	occupation	no	illness symptoms	no	JECH	24-74	yes	no
Palloni, Milesi, White & Turner (2009)	2008	yes	yes	yes	8512	GB	yes	education	yes	birthweight chronic conditions	yes	CDEWP	7-46	yes	yes
Paul & Moser (2009)	2009	yes	yes	yes	18000	META	no	unemployment, reemployment	no	mental health	no	JVB		yes	yes
Pavalko, Gong & Long (2007)	2007	yes	no	yes	5066	US	no	employment	no	mobility	no	JHSB	14-44	yes	no
Pelkowski & Berger (2004)	2004	yes	yes	no	13957	US	no	wages, hours of work	no	symptoms, limitations	yes	QREF	25-55	yes	no
Perrott & Sydenstricker (1935)	1935	no	no	yes	12000	US	yes	HH-income	no	chronic illness	no	AJS		no	no
Power, Matthews & Manor (1996)	1996	yes	yes	yes	17414	GB	yes	occ. group	yes	no	no	BMJ	7-33	yes	yes
Schmitz (2011)	2010	yes	no	yes	23734	DE	no	unemployment	yes	mental health hospital	yes	LE	28-58	yes	no
Schurer (2008)	2008	yes	yes	no	32224	DE	no	unemployment	yes	doctor hospital	yes	REP	40-60	yes	no
Schuring, Burdorf, Kunst & Mackenbach (2007)	2007	yes	yes	no	4446	EU	no	employment	yes	mental chronic disability	no	JECH	16-65	yes	no
Smith (1999)	1999	yes	no	no	10236	US	yes	wealth	yes	no	yes	AER		yes	no
Stansfeld, Clark, Rodgers, Caldwell & Power (2011)	2011	yes	yes	yes	9377	GB	yes	occ. class tenure	no	depression, psychological distress	no	SPPE	7-42	yes	yes
Stewart (2001)	2001	yes	yes	no	5817	CA	no	unemployment	no	limitations	yes	JHE	16-64	yes	no
Timms (1998)	1998	yes	no	yes	15000	SE	yes	occ. class	no	mental health	no	SSM	0-32	yes	no
van de Mheen, Stronks, Looman & Mackenbach (1998)	1998	no	yes	yes	2800	NL	yes	education, occ. class	yes	mortality symtoms chronic	no		15-59	yes	yes
Virtanen, Janlert & Hammarström (2013)	2012	yes	yes	no	1070	SE	no	temporary	yes	sleep, symptoms	no	AOEH	16-42	yes	no
Virtanen, Janlert & Hammarström (2012)	2012	yes	yes	no	1083	SE	no	unemployment	yes	mood	no	PH	16-42	yes	no

Table 3.1 – *Continued from previous page*

Wagenaar et al. (2012)	2012	yes	yes	no	7100	NL	no	unemployment	yes	symptoms	no	JOEM	15-65	yes	no
Warren (2009)	2009	no	yes	yes	2394	US	yes	no	yes	symptoms, sickness abscence	no	SF		yes	yes

Note: HS = Health Selection; DT = Direct Test; VS = Social causation versus Health Selection; LM = Labor Market; GP = "Good Practice"
Countries:US = United States; NL = Netherlands; DE = Germany; GB/UK = Great Britain/United Kingdom; NO = Norway; FI = Finland; AUS = Australia; IT = Italy; DK = Denmark; FR = France; EU = European Union; SE = Sweden; CA = Canada
Journals: SSM = Social Science & Medicine; JECH = Journal Epidemiology and Community Health; JHSB = Journal of Health and Social Behavior; JHE = Journal of Health Economics; HE = Health Economics; EJPH = European Journal of Public Health; EE = Empirical Economics; IZA = IZA Working Paper Series; SF = Social Forces; JOEM = Journal of Occupational and Environmental Medicine; PH = Public Health; AOEH = Archives of Occupational and Environmental Health; SPPE = Social Psychiatry and Psychiatric Epidemiology; AER = American Economic Review; REP = Ruhr Economic Papers; LE = Labour Economics; AJS = American Journal of Sociology; QREF = Quarterly Review of Economics and Finance; JVB = Journal of Vocational Behavior; CDEWP = Center for Demography and Ecology Working Papers; TAER = The American Economic Review; JCE = Journal of Clinical Epidemiology; JCASP = Journal of Community & Applied Social Psychology; ESR = European Sociological Review; BMJ = BMJ Public Health; IER = International Economic Review; SJWEH = Scandinavian Journal of Work, Environment & Health; EM = Economic Modeling; JPR = Journal of Psychosomatic Research; AJCP = American Journal of Community Psychology; NBER = Working Paper of the National Bureau of Economic Research; IJE = International Journal of Economics; AJE = American Journal of Epidemiology

3.2. The "Good Practice" Studies in Detail

3.2.1. Studies from Medical Sociology and Psychology, Epidemiology, Public Health, and Sociology of Health

Chandola et al. (2003) use the Whitehall II study from the UK to assess whether British white collar civil servants' health deteriorates when their job status does or whether it is the other way around. Regarding the labor market outcome the study is closest to my measurement of job status. It captures not mobility between occupations (which is often horizontal), but rather exclusively vertical mobility within occupations. The study uses a structural equation modeling approach with a cross-lagged panel structure. The health variables of interest are physical and mental health from the SF-36 and GHQ questionnaire measured as latent variables. They run their analyses separately for men and women, but do not control for any other factors in their model. The authors find almost no effect of health on employment grade, but rather robust results for the reversed causality. To sum it up, health selection is of minor importance according to their study. The measurement of health was well done, their dependent variable is similar to the one used in this study. The modeling is complex and catches the problem of reversed causality. However, they do not control for spurious correlation through third factor variables, and their sample comes from civil servants only.

Claussen, Bjørndal & Hjort (1993) use a sample of long term unemployed persons from 4 municipalities in northern Norway. They estimate the effect of health on chances of continuous unemployment and recovery through re-employment. The health items they use are a checklist of somatic symptoms, anxiety, and depression, and a score from the General Health Questionnaire (GHQ). Additionally, self-reported doctors' diagnoses were used. All health indicators suggested that there are health selection processes from unemployment to re-employment. Most substantial results came from the GHQ measure, anxiety, and doctor's diagnosis for psychiatric disease or personality disorder. They also found some evidence that re-employment led to recovery, but the effects were substantially lower than the health selection effects. A strength of the study is that they used a number of important variables suggested by human capital theory as controls. These include gender, SES, social networks, education, and labor market experience. This reduces the chance of estimating spurious effects of health. The limitations are clearly that they only have two time points, and the sample is restricted to a small area in Norway, making generalizations difficult.

Power, Matthews & Manor (1996) use the British 1958 Birth Cohort study with 17,414 participants to analyze health selection and social causation. The study follows the subjects from ages 7 to 33. They look at the influence of childhood health on subsequent adult SES and of parents' SES on adult health. They analyze health selection and social causation in separate models looking at unadjusted odds-ratios. The choice of SES indicator is occupational

group. They only consider persons in poor health in their health selection analysis disregarding the possibility that good health might also lead to social mobility albeit in a positive way. The health selection effect is characterized as negligible. Social causation is preferred as the way to explain health inequalities in adult life. The study lacks controls for possible third factor explanations and comparability of effects across models is questionable.

Eaton et al. (2001) look at the association of SES and depressive syndrome over the life course. They estimate the effect of childhood SES on young adult depression, and of parent's depression on early adulthood SES. Additionally, the effect of early adulthood SES on depressive syndromes in later life are examined, as well as early adulthood syndrome on later life SES. In later life, job percentile according to the Nam method were used, as well as income percentile, and financial dependence. The sample was taken from residents in east Baltimore in the US resulting in a sample of only 907 subjects. Depression was measured by the Diagnostic Interview Schedule. Results show almost no association of depression with SES over the life course, neither as a result of SES nor as a selective factor. The strength of the study is the life course perspective allowing for different mechanisms and stages of the SES-depression association. It is also noteworthy that they use relatively fine grained measures of SES instead of broad categories. The limitations lie again in the sample both restricted to a part of Baltimore and the sample size. Only a very limited number of control variables (such as gender) were used. Additionally, model selection was based on statistical significance of indicators, not theory based, which yields problems of both statistical and theoretical nature.

The study by Elstad & Krokstad (2003) analyzes health inequalities in a longitudinal study in Nord-Trondelag. They try to test social causation versus health selection with a time lag of 10 years for a sample of 9,189 men aged 25-49 and 35-49 respectively. They use multinomial logistic regression to evaluate the effect of subjective health on mobility between three occupational groups, and into and out of employment. They use separate models, not a joint estimation. Further they only use age as a control variable. Other ways of excluding third factor explanations are not used. The authors admit that occupational mobility might be underestimated by the crude measurement. They conclude that widening health inequalities among continuously employed persons should be attributed to social causation while the widening health gap between employed and non-employed men is mostly a result of health related mobility. The most obvious limitations of the study are its regional and gender restrictions. Further improvement could have been made by controlling for third factors in the regression models. The comparability of the coefficients between models is also problematic.

Halleröd & Gustafsson (2011) conduct a study in Sweden following subjects over 16 years. They analyze different aspects of SES - similar to the study of Eaton et al. (2001) - and their relationship with health. Their health indicator is morbidity measured by the report of

longstanding illness, handicap or weakness. They use latent growth curve models to analyze the association between initial SES and health, and trajectories of SES and health in further life. They can show that both health selection and social causation are at work in their sample. Initial SES is measured by occupation and household income. It predicts subsequent morbidity and vice versa. Interesting is that they also test changes in SES and health as predictors of changes in the other, respectively. This is a feature which latent growth curve modeling allows them to do and constitutes a stronger test of the hypotheses, because it excludes time constant unobserved factors as explanations for the association. They find strong evidence for the association of changes in health with changes in SES. Their method does not allow, however, to determine the direction of causality in this regard. They only control for gender and age. The strength is the representative survey over a period of 16 years. Their complex model allows to conduct stronger tests of their hypotheses than other studies do. The only drawbacks are the small number of controls (and no stratification across gender) which is probably due to the already complex model, and that they cannot establish a direction of causality in the analysis of change of SES and health. Still, together with the study of Chandola et al. (2003) this presents one of the best studies among the "good practice" studies with regard to data and modeling.

A wide range of different diseases, and mental disorders among health care professionals in Finland was used by Heponiemi et al. (2007) to assess health selection and social causation with regard to unemployment. They linked several official register data of health care professionals with employment statistics and hospital discharge registers to obtain their sample. They adjust their logistic regression for age, income, marital status, and educational level, running separate analyses for men and women. Unemployment had no consequences on hospital admissions. Selection was found among women for diseases, and among men for mental disorders. They refer to their analysis as cross lagged panel analysis. The strength of the study lies in the use of objective data from registers and its huge sample size suggesting high quality of data. The offside is that only health care workers were analyzed, other occupations were not included. Especially with regard to health consequences it seems unlikely that health care workers experience of health problems can be seen as representative in its effect for the population in general.

Mulatu & Schooler (2002) use a nationally representative sample from the US to estimate reciprocal effects of health and SES. They use a non-recursive SEM approach with health and SES from 20 years ago as instruments for contemporary health and SES, controlling for age, race, and gender. They allow the relationship to be mediated by behavioral factors and find that weight and sleeping behavior mediate part of the health selection effect, while health behavior and psychological distress mediate part of the effect of SES on health. Rather broad categories of education, income, and occupation were used as measures of SES. The indicators for health are self reported serious physical illness or injury, and the impact of health

problems on the individual's life. The strength of the study lies in the adequate modeling of reversed causality and the analysis of mediating factors. Problematic are prior health and SES as instrumental variables to identify the model under the equilibrium assumption and the lack of temporal order in the association of SES and health. The sample size is rather small with about 700 subjects included in the analyses. SES is measured by fairly time constant factors like education or broad occupational classifications, allowing for little variation over time.

A meta-analytic study on the relationship of mental health and unemployment was conducted by Paul & Moser (2009). They found a substantial difference in mental health between unemployed and employed favoring the employed. The selection effect they found was smaller, characterized by them as weak (less than half the size of the social causation effect). However, the selection effect is almost as strong as the causation effect if only longitudinal studies are taken into account, which is a feasible approach given the complex nature of the causal relationship. Therefore my interpretation of the health selection effect would differ from the authors' view with regard to relative strength. A special feature of their meta-analytic approach is that they can assess mediators of the association of mental health and unemployment. It shows that e.g. high unemployment protection reduces the association, pointing to important aspects of social context.

The study by Stansfeld et al. (2011) follows a similar design as the study of Eaton et al. (2001). They assess the effect of childhood and early adulthood SES on depression and anxiety and the reversed causality. Their sample comes from the 1958 Birth Cohort in England, Scotland, and Wales. SES was measured by manual vs. non-manual occupational class. In adulthood, it was also assessed by home owner status. Depression and anxiety were measured by the Revised Clinical Interview Schedule. Their results point to a process of health selection and give some smaller support to the social causation hypothesis. The study does not assess the reversed causality in a SEM framework. Their SES measure is very crude and the analyses are only adjusted for gender.

Warren (2009) conducts a study using longitudinal data from Wisconsin to assess reciprocal causality between SES and health. His approach is again similar to Eaton et al.'s (2001). He follows the subjects over the life course from childhood to adulthood. He uses cross lagged panel analysis in a SEM framework to test the hypotheses. SES was measured by earnings, occupational education, and wealth. Health is measured as a mix of self-rated health, muscular-skeletal symptoms, and depression. The author finds no health selective mechanisms in his sample. Social causation, however, seems to play a role in the generation of health inequalities. The measurement model and design of the studies are well done. However, the model does not include any control variables, except for separate analyses for men and women. The use of occupational education as indicator for SES can also be seen with skepticism.

van De Mheen, Stronks & Mackenbach (1998) present the fourth study of "good practice" with a similar design to Eaton et al. (2001). Their sample comes from the Dutch city of Eindhoven and consists of a cross-sectional analysis with a follow up study. They measured SES as highest education and occupational level (EGP) of the respondent and head of household. Health indicators that were used included self-reported health, complaints, chronic conditions, and mortality. They report substantive reductions in health gradients when controlling for background SES, but no effect of health on subsequent occupational orientation or educational achievement. They find the social causation hypothesis supported in contrast to the health selection hypothesis. The modeling of reversed causality is less refined than in the SEM approaches used by other studies. Their measures of SES are very broad and the link to health selective mechanisms is unclear.

Palloni et al. (2009) use longitudinal data from Great Britain to look at the effects of childhood health on educational and occupational attainment in adulthood. They restrict their sample to boys. Birth weight is used as a very early measure of health. In addition they measure chronic conditions in childhood and adolescence. SES is measured as self-reported occupational ranking on a six point scale. Using a SEM approach they cannot find any indication of health selection from children's health status to occupational level in adulthood. While the study takes an interesting life course perspective, their measure of SES is very broad and the proposed hierarchy of occupational status is unconvincing.

Huurre et al. (2005) again use an approach which is similar to Eaton et al. (2001). Their study is based on a sample of 1262 men and women in Tampere in Finland. They look at the reverse effects of psychosomatic distress and SES over the life course. SES is measured as manual vs. non-manual occupation, in midlife as educational attainment. Psychosomatic distress was measured as a latent variable captured by 4 indicators of psychosomatic symptoms. They use a SEM cross-lagged panel approach to estimate the relative effect sizes. The authors find that both health selection and social causation play an important role. Health selection from young age to education was especially important for men. It shows that no one model can explain the association of SES and psychosomatic health. Overall the study was well conducted, but lacks certain control variables to capture common background factors. The sample is also restricted to one city in Finland reducing the possibility for generalization.

In a UK study 8,312 men and women were repeatedly screened for several biomarkers indicating health status. In addition, childhood conditions were asked in form of hospitalization and birth weight (Elovainio et al. 2011). Occupational class and promotions were assessed in adult life. In this form the study explicitly tests health selection versus social causation. They use separate models for the test of health selection and social causation. The authors adjust their analyses for age, gender, and previous measures of the dependent variable. Other measures

to exclude third factor explanations were not taken. They can show that childhood conditions are associated with lower occupational status. On the one hand, adult health problems are not associated with likelihood of promotion. On the other hand, adult downward mobility with regard to occupation increases cardio-metabolic problems. The authors conclude that health selection operates in younger years while social causation becomes more important in midlife. A strength of the study is the use of a wide range of health indicators checking for sensitivity of the results. However, third factor explanations are not controlled for and comparability across models is difficult. Having said that, the authors used multiple imputation to deal with missing values which is rarely done, but very commendable, because it is appropriate in most observational studies.

The interesting study of Aittomäki et al. (2012) uses a cross-lagged SEM approach to assess the dual causal relationship between SES and health. The data they use are register data from Finland with a large nationally representative sample. They use sickness allowance days as a measure of health problems. They assume that health has a direct impact on labor market advantage measured by individual income and unemployment, but only an indirect effect on future economic resources. This theoretical consideration is close to the argument made in this thesis giving precedence to market generated inequalities as the outcome of differences in health. They find that both health selection and social causation are supported by their data. The strength of the social causation parameters are stronger, though. A novel feature of their study is that they consider the impact of possible degrees of measurement error in their variables on the estimates. They find that assuming a higher degree of measurement error increases effects. This is not surprising, because it conditionally reduces variances in the predictors leading to inflated coefficients. A better approach would be to vary the assumed degree of measurement error unequally across measures based on theoretical considerations. The strength of their analysis is the nature of the data and their complex statistical model, which follows careful theoretical arguments.

3.2.2. Studies from Health Economics

Böckerman & Ilmakunnas (2009) analyze the relationship between unemployment and self-rated health in Finland using the European Community Household Panel for Finland. Health is measured via the standard self-rated health survey item. They use a difference-in-difference estimation technique to assess whether unemployment affects health or the other way around. In their diff-in-diff analysis and in various other model specifications they cannot find a substantial effect of unemployment on health. However, subjective health proves to be a predictor of subsequent unemployment. The authors do not use causation or selection hypothesis as terms - this is rarely done in economics -, but their results clearly support the health selection hypothesis for Finnish unemployed. The strength of the study lies in its modeling techniques,

which control for time constant unobserved heterogeneity, and some observed time variant variables. On the other hand a SEM was not used.

A cross-sectional data set from Australia is the basis for Cai & Kalb's (2006) analysis on the relationship between labor force participation and health. The health item used is the common self-rated health survey questions. They estimate simultaneous equation models for men and women separately. Their models control for a wide range of labor market and household related variables. They find a clear and strong effect of health on labor force participation, which is stronger for women and older study subjects. Social causation is also found in the parallel equation. Labor force participation is beneficial to subjective health status. The results point to a clear feedback mechanism in which bad health reduces labor force participation, and being out of the labor force reduces health status. The strength of their study lies in the usage of high quality data and suitable modeling techniques including controls for spurious correlation. The study is one of the best when it comes to modeling the complex relationship between health and labor force participation. The cross-sectional nature of the study leaves room for improvement with regard to modeling of temporal priority.
In a further study Cai (2010) uses longitudinal data to reanalyze his previous study. He introduces a random effect structure to control for time constant unobserved heterogeneity. Results show that health has a strong influence on labor force participation. The reverse causal direction holds only for men.

Haan & Myck (2009) use the German Socio-economic Panel Study (SOEP) to assess the relationship between health and non-employment. They use self-rated health as a health indicator and pool unemployed and non-employed as a labor market risk group. They estimate a simultaneous hazard equations model, controlling for various confounders in different specifications. Similar to the results of Cai & Kalb (2006) they find a positive feedback mechanism between employment and health. Both social causation and health selection mechanisms can be detected. The strength of the study is clearly the use of high quality data with up-to-date SEM methods controlling for confounders and allowing for temporal ordering. The authors, however, seem to unnecessarily restrict their sample to men aged 30-59, probably the most over-studied group in the literature on labor market processes.

The Panel Study of Income Dynamics (PSID) is the basis for the analyses conducted by Haveman et al. (1994). They look at the interrelationship between wages, work hours, and health. Their health indicators are self-reported health and health related work limitations. They estimate a complex three equation simultaneous equations model. They find that health limitations have a negative impact on work hours and wages while work hours have no effect on health. Their complex model tries to capture the difficult inter-relationship between health and labor market outcomes. However, they do not make use of the panel structure of the data

and they restrict their sample to white men aged 25-65 who are head of the household. This refers again to the most over-studied group in labor economics.

Lee (1982) also employs a simultaneous equations approach for wages and health. The health indicator is the self-rated health item and a report of health limitations. They use one wave of the National Longitudinal Survey of men aged 45-59. They find evidence that wages and health affect each other in a feedback mechanism. They introduce SEM at an early stage of the research literature, but use only cross-sectional data on men aged 45-59.

Summing up, we can note the following insights from the literature review. Most studies which look explicitly at SES and health either find no support for health selection or conclude that social causation is more important. A clear exception are studies on employment.
Regardless of the health indicator, various studies from different countries, using different methods found a clear link between health and labor force participation or unemployment. The majority of those studies agree that the major part of this effect can be attributed to a health selection process. This means that the recent state of art allows us to draw the conclusion that participation on the labor market depends strongly on individuals' health. The labor market is the most important source for income for most households and plays a crucial role for social integration. These results alone disqualify any claims that health selection is generally a negligible factor when looking at health inequalities.
Looking at the studies in the review we can see that different dimensions and indicators of health are used when assessing health inequalities. However, there seems to be no clear pattern whether some dimensions provide stronger evidence for social causation or health selection. The use of varying indicators thus presents a problem, because it remains unclear what role the health measure actually plays. There are too few studies, and too many different health measures to make a statement about any clear trends at this point.
Education is used several times as a measure of SES. It has the advantage of being universally available. On the other hand, education changes very little after a certain age, leaving little room for health selective processes. Employment is another measure which is often used. In its broadest sense it can also be applied to all individuals and is very responsive to other socio-economic conditions and to health. Occupation, or occupational group is the measure of SES which is used most often. Most studies use broad categories with six or less categories, sometimes adding a non-employment category. There are several possible reasons for this common use of occupation. First, it has a long tradition in health inequalities research to look for occupational differences in health. Second, occupation is rather stable, yet can change more than education, especially downward mobility is possible. Third, income can be seen as a derivate of occupation. In this sense occupation would be a more fundamental cause of health than income. Fourth, besides education, occupation is the measure which allows the easiest estimates of intergenerational mobility in addition or instead of intragenerational mobility.

One concern I have with several studies reviewed here is that they dismiss third factor explanations too easily. If health has common correlates with e.g. skill, or personal characteristics like locus of control, any association might be spurious. The responsible factors for the association might lie in childhood. If interactions of acquired childhood characteristics with changing environment over the life course is considered it is even unclear whether methods like fixed-effects can account for such spurious correlation. It is advisable to conduct sensitivity analyses, which indicate how strong a common background factor must be correlated with health and SES to account for estimated effects in the study (for such an approach see Do, Wang & Elliott 2013).

4. Methods

In this chapter I present the methodological approaches I choose to adress the formulated hypotheses. I explain my notion of causality, explain how I measure health, and describe various regression and decomposition models I employ.

4.1. Health Selection vs. Social Causation - The Issue of Causality

4.1.1. The Counterfactual Model of Causality

In this thesis, I propose different theoretical explanations of how health selection processes can generate health inequalities. I apply the theory to health differences between incumbents of high status and of regular jobs. The theory makes clear statements about causal mechanisms. The question is now, which methods are adequate for testing these causal relationships?
I will address this question in two steps. First, I will define the concept of causality I am using and describe what problems arise when testing causal claims based on this notion of causality. Second, I will describe which specific problems apply to my empirical example of high status job attainment on the German labor market using SOEP data. I will show caveats and how I will deal with them. Finally, I will sum up and discuss in what sense "effects" from the statistical models should be understood as causal in this thesis.

Discussing causality is important, because sociologists have changed their way of treating the matter of causation (Bernert 1983). In my thesis I use the model often referred to as the *counterfactual model of causality*. In economics it is clearly the dominant framework of causality (Angrist & Pischke 2010). A similar trend can be observed for sociology (Gangl 2010). Another term for the model is the *Rubin causal model* (RCM) after Rubin (1974) who introduced it to non-experimental data. Rubin calls the model *potential outcomes*. I will use the terms *counterfactual model* or *counterfactual argument* throughout the thesis.
I chose the counterfactual model for two reasons. First, it reflects the current state of the art regarding causality in (quantitative) social sciences (e.g. Angrist & Pischke 2010, Gangl 2010). Second, it has a clear theoretical definition of causality and is able to transfer this definition unambiguously into statistical models which can be applied to quantitative data analysis.

4.1.2. The Counterfactual Argument

When talking about treatment and outcome in this section the most basic criterion which needs to be fulfilled is the temporal relationship. The treatment has to come before the outcome, otherwise it cannot have a causal effect on the outcome (Ward 2009). Following the counterfactual model of causality researchers ask the "what if" question. The interest lies in the effect Y of a certain treatment X on a particular unit *i*. To answer the question if X causes Y one asks "what would have happened to unit *i* if it had (not) been treated with X?". The actual outcome, that is the outcome that really happened, is compared with the counterfactual outcome that would have happened if the treatment had been withheld - all other things being equal. One thus tries to compare two different versions of reality which vary only in regard to whether unit *i* is given the treatment or not (Kaufman & Poole 2000, 102). This is done for every unit under observation. The difference between the actual and the counterfactual effect is called *unit effect* (Winship & Sobel 2001, 14).
For the purpose of my study one would ask for example: What would happen to a certain worker's job status if he was not in poor health, but was in good health? The difference in job status between the actual outcome (poor health) and the potential outcome (good health) is the unit effect.
Due to the fact that one of the outcomes is unobservable, the unit effect is by nature not measurable. If one unit has been treated it cannot be compared with its untreated status since it has already been treated. This problem is known as the "Fundamental Problem of Causality" (Holland 1986, 947).
The good news is that compared to others sciences (like e.g. medicine) in social sciences the single unit effect is rarely of high interest. The focus lies on the *average treatment effect* (ATE) which is the average of all unit effects. This means that social scientist do not ask: What happens to the career prospects of a specific worker if his or her health changes? Rather they ask: What happens on average to the career prospects of workers if his or her health changes by a certain degree? The equation to calculate the ATE is (Winship & Sobel 2001, 18):

$$\bar{\delta} = E[Y_t - Y_c] = E[Y_t] - E[Y_c] = \sum_{i \in P} \frac{(Y_t i - Y_c i)}{N} \tag{4.1}$$

where P denotes the population under observation, the index *t* stands for treatment while *c* stands for non-treatment or control. δ can only be estimated, never measured or calculated directly. For the calculation the unobserable counterfactual outcomes are needed. To make a consistent estimate of δ a sufficient assumption is that the treatment effect on the treated (ATT) is the same as the treatment effect on the untreated (ATU) and that the non-treatment effect is the same for the treated and the untreated:

$$E[Y_t|X = t] = E[Y_t|X = c]; E[Y_c|X = t] = E[Y_c|X = c] \tag{4.2}$$

The assumption implies that for example the job status of those workers who are actually in poor health is affected in the same way as would the job status of those workers who are actually in good health if they were in a different health state.

The assumption of equation 4.2 can be achieved through randomized assignment of the treatment as done in experiments (Winship & Sobel 2001, 22). If equation 4.2 holds true, the ATE can be calculated as:

$$\bar{\delta} = E[Y_t|X = t] - E[Y_c|X = c] \tag{4.3}$$

This means that if health status were assigned to workers randomly, the difference in job status between the groups of the treated (good health) and the untreated (bad health) would be equal to the ATE of health on job status.

If random assignment cannot be guaranteed[1] this estimation might be biased for two possible reasons:

1. The baseline difference in the outcome Y is unequal to zero.

2. There is a difference in the treatment effect between the treated and the controls.

Bias 1 means that the treatment group has a higher level of the outcome variable Y (e.g. job status) than the non-treatment group before the treatment. So the difference in Y measured after treatment cannot be attributed to the treatment, but to some other causes prior to the treatment. For example, workers in good health might for different reasons be in better jobs before they experience a change in health than those workers who are in bad health. The difference then does not stem from the treatment, but from some other cause (e.g. difference in education as a common cause for job status and health).

Bias 2 states that the ATE is estimated incorrectly if the treatment has a different effect for the treated than for the untreated. This is often the case in processes of self selection into the treatment[2]. The second bias does not have to be a problem for a researcher. It depends if one seeks to estimate the average treatment effect on the whole population or if one is interested in the treatment effect on the actually treated (ATT). In the latter case bias 2 can be admitted freely, but ignored as the conclusion which is drawn is limited to the group of the treated (Winship & Sobel 2001, 23-24). For this study it means that I could state for example that a change of health status (treatment) does have a negative causal effect on workers' job

[1] As it is certainly the case with health due to practical and ethical reasons.
[2] Those who benefit more are more likely to choose the treatment.

status. But I can only say that it has this effect for those workers who actually experience a change in health. I do not know if a change in health would have the same effect on those who were not treated (and did not change their health status).

A weaker form than random assignment to overcome bias 1 is *ignorability*. It relaxes the assumption that the treatment is independent of all variables. It only states, that the treatment is at least independent of the potential outcomes (Winship & Sobel 2001, 26-27):

$$(Y_t, Y_c) \perp X \tag{4.4}$$

Unfortunately *ignorability* is rarely given in social sciences and, as will be shown later, is not given in this study. Rather the probability is dependent on other variables Z. But it can be argued that given the probability to get the treatment (P(Z)), ignorability holds:

$$(Y_t, Y_c) \perp X | P(Z) \tag{4.5}$$

This is also called the *conditional independence assumption* (Dawid 2000, 419). It would mean for example that health (the treatment) is not independent of job status (the outcome). Due to some other factors the workers in regular jobs have worse health than workers in high status jobs. At the same time these factors (e.g. education) influence the chance of being a regular worker. Therefore regular jobs and health are not independent.
However, one can estimate the probability to be in a certain health state dependent on these factors, which link job status and health. Given this probability[3], health can be seen as if it were randomly assigned with regard to job status.

The model to estimate P(Z) has to be complete for the ignorability assumption to hold. This will be a problem if there are important unmeasured variables which can bias P(Z).

As Rubin (2005, 324) states: In the end "[...] causal inference is impossible without assumptions." Consequently, I will make an effort to guarantee that the conditional independence assumption holds true, so that causal inference is possible from the estimates in my thesis.

4.2. Applying the Counterfactual Model

After this general discussion about causality, I will go into more detail about problems that arise when trying to estimate health selection effects on the labor market. I will first discuss the direction of causality and related problems, then spurious correlation and problems of measurement. Last, I will review in how far I can test causality and under what kind of limitations the estimates in the analysis section should be understood as causal.

[3]This means comparing those with the same probability to be in a certain health state, but differing in the actual fact that some are in this certain health state and others are not.

4.2.1. Direction of Causality

The most obvious problem with job status and health is the direction of causality. Usually health inequalities are explained by the social causation approach (see section 2.1.3). For my case that means explaining how resources or working conditions of workers in high status jobs are beneficial to their health, generating an overall higher health status for incumbents of high status jobs.
So how do I make sure that my estimates of health influencing job status are not merely artifacts produced by reversed causality, meaning job status influencing health?
The first step in excluding reverse causality is that all analyses presented in this thesis - if not stated otherwise - look at the effect of health at time point t on job status one year later (t+1). This ensures that the treatment (change in health) comes before the outcome (change in job status). However, this does not solve the problem of anticipation effects. It could be that a change in job status is expected or anticipated by the individuals (for a theory of anticipation, see Tavory & Eliasoph 2013). This might lead to the fact that the positive or negative psychological effects of status change already influence the individual at an earlier point in time. In addition, an adaption to the new situation with regard to resources might occur earlier than the actual change. In some cases it might be preceded by e.g. an increase in wages.
The second problem of reversed causality due to anticipation will be addressed in the following manner. I will introduce three variables into the regression equations which are supposed to capture the psychological effects of an anticipation of a job change. These variables measure satisfaction with work, worries about own economic situation, and worries about job security. In combination with a measure for wages they should be adequately capturing any anticipation effects.

4.2.1.1. Closed Positions and Anticipation Effects

In my theory I argued that a distinction between open and closed positions on the labor market can yield important insights in the interaction of context and health selection.
The analysis of closed positions has an additional advantage. If the estimated health effects are due to the *anticipation* of the event - following the *social causation* instead of the *health selection* hypothesis - there should be no differences between open and closed positions regarding the health effect.
This means that a certain worker would anticipate that he or she will receive a certain (positive or negative) labor market reward in the future. For my analysis this would just need to be an anticipation of a reward within the next year which is a plausible assumption. If the worker expects the rewards the psychological reaction could precede the actual reward. The methodological interesting part about a distinction between open and closed position is the following. There is no reason to assume that the effect of job loss or high status attainment

on health is different for incumbents of open or closed positions. Therefore the reaction should be the same as well. If the reaction is the same, then the estimated effects should be the same for open and closed positions.
With this in mind, I can counter the argument that the estimates in my model are simply anticipation effects of future labor market rewards. If we find that open positions show health effects and closed positions do not, it speaks against the anticipation hypothesis. If health effects are found both in open and closed positions, brushing off the anticipation hypothesis could be a mistake.
Bringing anticipation effects into the formal equation, we would view health as a function of the anticipation of the labor market reward:

$$LMR = \alpha(e(H(A_{LMR}), E_{NLM}) * \tau)^{\sigma*|A-c*d|}t \tag{4.6}$$

4.2.1.2. Testing Causality in One Model

Another important step in estimating causal effects of health on job status is to consider both directions of causality at the same time. In section 3.1, I argued that one criterion for a "good practice" study is exactly this simultaneous test of the health selection and the social causation hypothesis. This allows the evaluation of the hypotheses in a framework, which makes them comparable with regard to the magnitude of the estimated effects. The question can be addressed whether social causation effects play a bigger role than health selection effects in creating health inequalities between job status. Section 4.7 describes the respective statistical model.

4.2.2. Spurious Correlation

Another problem with establishing a causal relationship between health and job status is that there might be third factors influencing both health and job status. For example, the positive relationship between health and high job status could be caused by the education differential of the two groups. Individuals with higher education take more or more efficient care of their health and are therefore in better health. They are also much more likely to occupy a high status job. Another example would be the unobservable rate of health deterioration and unobserved skills or productivity which might cause the gradient in the relationship of job status and health (Case, Fertig & Paxson 2005). The correlation between health and job status could therefore be spurious.
Of course, spurious correlation is hardly a new problem in social sciences where experimental data are unavailable. What has to be done to uphold the conditional independence assumption is to control for all important factors which might influence both health and job status. Relevant factors for labor market rewards are captured in my theoretical model. For each construct

suitable indicators are chosen to make the conditional independence assumption as plausible as possible. In section 4.9.2 the control variables are listed and described.

4.2.3. Are the Estimated Effects Causal Effects?

So, can we interpret the effects estimated in these models as causal in nature? The study design and the statistical model of cross-lagged panel with fixed-effects adequately captures possible confounders from spurious correlation, simultaneity, and reversed causation. Therefore, I think that the proposed estimates represent the strongest test of causality available for the subject under investigation. Using different modeling approaches throughout the thesis further increases the reliability of the results, because they present a form of robustness check. The effects of health on job status, which are estimated are therefore treated as causal estimates in the rest of the thesis. The known limitations are explicated here and are not repeated every time in the results part.

4.3. Measuring Health - Methodological and Theoretical Implications

Estimating the impact and relevance of individuals' health on their labor market outcomes is the main purpose of this study. For this purpose it is necessary to address the question of how health is measured. In the public health literature on the measurement of health in standardized surveys two very general distinctions are made. First, it is distinguished between self-reported measures and measures reported by third-parties. In the first case the respondents of the survey answer questions regarding their health, illnesses, injuries, or well-being on their own. The interviewer (usually) has no way of controlling the answers a person gives. Reports by a third party are usually made by either the interviewer or a doctor through tests, blood or saliva samples or through medical records. These are then used to measure the health status of the person. In most surveys which do not have a special focus on health, self-reported measures are the standard, as they are much easier and cheaper to acquire, require less expert knowledge and are not invasive.

The second distinction is between so called objective and subjective measures of health. An objective measure should return the same results for two persons in the same state of health every time. In practice objective health measures can be and are subject to reporting bias. However, reporting bias is a much bigger issue with subjective measures. Subjective measures leave the response (to a survey question) to the perspective of the respondent. For example, if a person is asked to rate her health, the answer "good" might mean something very different for person A than it does for person B. This has two implications. First, it is a reasonable assumption that subjective health measures are subject to higher degrees of measurement error

than objective measures. Measurement error can lead to bias in estimates of health effects usually underestimating the true effect of health (Bollen 1989). Second, subjective measures might be systematically biased due to different reporting behavior of certain social groups (e.g. men and women). This would make comparisons of subjective health measures between these groups problematic. As the comparison of health effects between men and women is a central element of my thesis, I will deal in detail with this possible reporting heterogeneity with regard to subjective health in the next sections.

I will give an overview over the literature stating the problems regarding self-reported and subjective health measures in survey research, present solutions offered so far, and discuss these studies critically with regard to transferability to my case. In the end, I will present my own approach to the problem which is a confirmatory factor analysis (CFA). I will present the idea, the concept, the estimation techniques necessary for this approach, and discuss its advantages and limitations.

4.3.1. Literature on the Measurement of Subjective Health

The gold standard of external reliability in health measures is usually mortality. Therefore a lot of studies deal with the question whether self-rated health can predict mortality. It is generally agreed upon in the literature that self-rated health is a very good predictor for mortality (Jylhä, Guralnik, Ferrucci, Jokela & Heikkinen 1998, Quesnel–Vallée 2007, Dowd & Zajacova 2007, Huisman, Van Lenthe & Mackenbach 2007, Singh-Manoux, Dugravot, Shipley, Ferrie, Martikainen, Goldberg & Zins 2007, Singh-Manoux, Gueguen, Martikainen, Ferrie, Marmot & Shipley 2007, Subramanian & Ertel 2008, Jylhä 2009, Nishi, Kawachi, Shirai, Hirai, Jeong & Kondo 2012). However, these studies report different degrees of predictive power of self-rated health on mortality. Sometimes the predictive power of self-rated health on mortality is found to vary with SES (Singh-Manoux, Dugravot, Shipley, Ferrie, Martikainen, Goldberg & Zins 2007, Huisman, Van Lenthe & Mackenbach 2007, Dowd & Zajacova 2007) or gender (Jylhä et al. 1998, Nishi et al. 2012). Sometimes no such interactions are found (Subramanian & Ertel 2008), or the results are not conclusive regarding the direction of the interaction (Jylhä 2009).

A review of the most important studies can be found in the appendix in section A.4. It can be summarized with two main conclusions. First, most studies use a sort of index of objective health measures as "true" health, with the exception of the study by Shmueli (2003). Second, there is no common agreement on reporting heterogeneity. Studies with different datasets from different countries report varying degree of reporting heterogeneity or none at all. It seems therefore wise to test reporting heterogeneity in the SOEP, as it is unclear what can be expected.

4.3.2. Measurement of Health in this Study

As already stated, I use the "social model" of health using the WHO definition. The concrete way I measure health is similar to the approach of Shmueli (2003). My intent is to use self-reported health measures which are available over several points in time to measure the latent variable I call *latent subjective health* (LSH) or short latent health or simply health. Latent subjective health determines the observed variables self-rated health (SRH), satisfaction with health (SAT), and worries about own health (WAH). As my research design is mainly of longitudinal nature, *change* in latent subjective health is therefore the main variable of interest. The definition of change I use in this context is:

"Change is regarded as the occasion-specific deviation of a test or item score from a stable person-specific level" (Eid 1996, 66).

The problem I am facing is that in contrast to most psychological studies my indicators (SRH, SAT, WAH) were not constructed to measure a latent variable as a set of items. I combine these three indicators out of necessity. It is necessary to take this into consideration when evaluating the model fit, because the model fit will be worse than in psychological studies that use indicators explicitly designed and pretested to measure a certain latent trait.

4.4. Confirmatory Factor Analysis

The methodological idea behind my approach of measuring health has a long tradition in psychometric research. Some concepts cannot be measured directly. Instead, we look for indicators which represent the concept. These indicators are prone to varying degrees of measurement error. This might be random measurement error or systematic measurement error (Bollen 1989). Choosing a latent variable approach we assume that our concept (in the following health) is a latent metric variable which is normally distributed. In survey research health is usually measured on a five-point-scale which captures the self-rated health in an ordinal fashion. This indicator is a hierarchical categorization of the latent linear health variable with both a loss of information, random measurement error, and potentially systematical measurement error. If health is measured with more than one indicator, it is possible to estimate the latent metric variable health by confirmatory factor analysis (CFA).

Figure 4.1 captures the concept. Health is measured by the indicators Self-rated health (SRH), satisfaction with health (SAT), and worries about own health (WAH). Each indicator is seen as the dependent variable in a regression model of the indicator on the latent variable with an intercept. The following equations define the latent variable health (H):

$$WAH_i = \alpha_{WAH} + \lambda_{WAH} H_i + \epsilon_{i,WAH}$$
$$SRH_i = \alpha_{SRH} + \lambda_{SRH} H_i + \epsilon_{i,SRH}$$
$$SAT_i = \alpha_{SAT} + \lambda_{SAT} H_i + \epsilon_{i,SAT}$$

These equations do not take into account that the indicators used are ordinal and not metric. For the time being I will stick to this simplification, because it makes the argument for my methodological approach easier to understand without loss of generality. In the next section, I will explain the necessary modifications for incorporating indicators containing ordinal information. I will use an analysis of the correlation matrix of the three observed variables generated by polychoric correlation (see 4.4.1).

For the model above to be identified an additional assumption has to be made. Usually, either one of the factor loadings (λ) is fixed (to 1) or the variance of the latent variable is fixed (to 1). It does not matter which one is fixed, the models are equivalent with different scaling parameters.

Referring to the literature I interpret the estimated latent variable as the "true health" I am really interested in.

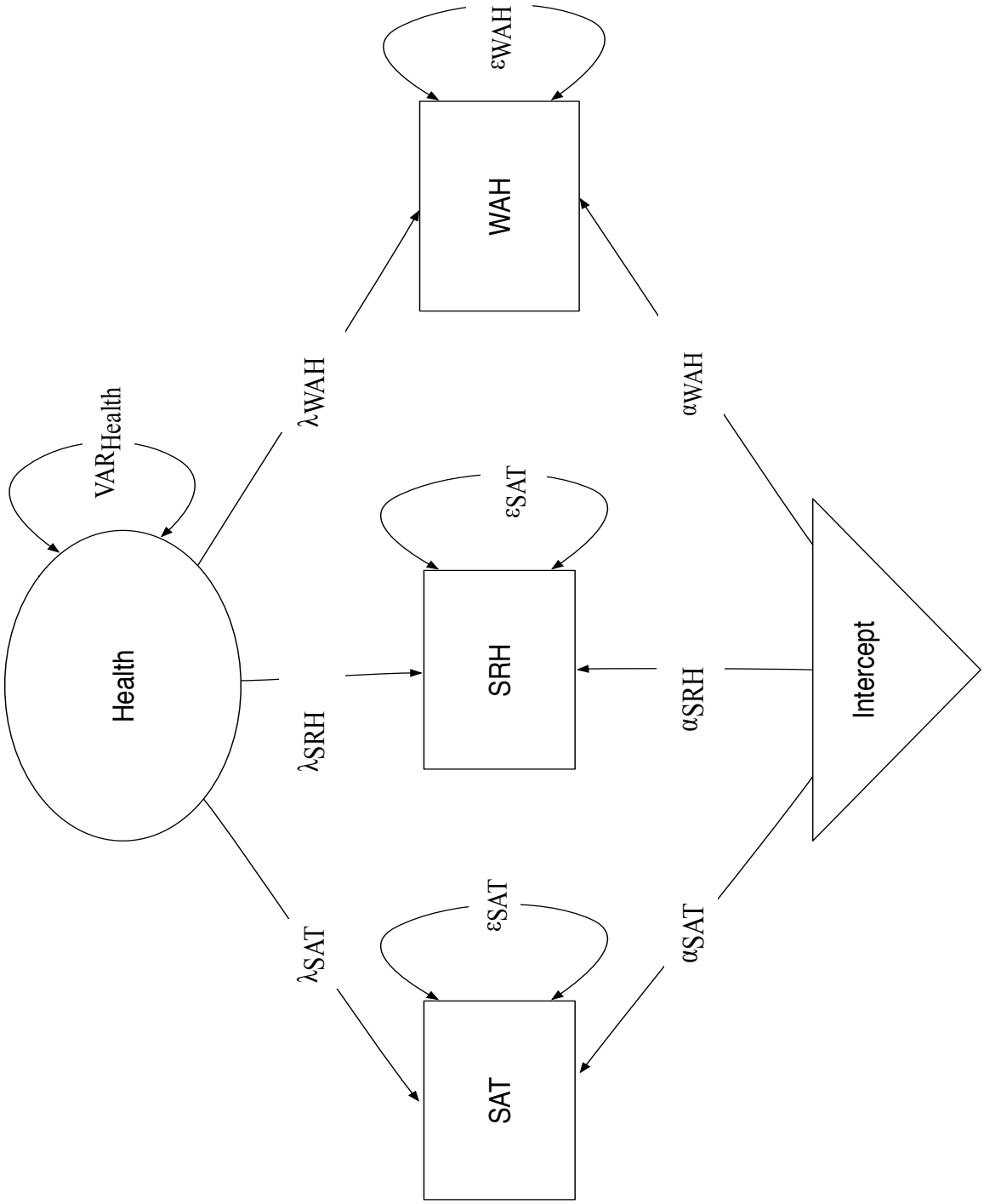


Figure 4.1.: Health as a Latent Variable

4.4.1. CFA with Categorical Dependent Variables

Polychoric correlation is used if Pearson correlation, which assumes interval scaled variables, cannot be used. In much of social sciences research variables are measured on ordinal (likert) scales. Such is the case with the subjective health indicators in the SOEP. The basic assumption is that the observed ordinal variables are determined by latent unobserved variables, which are continuous and normally distributed. Based on the probability distribution of the contingency table polychoric correlation is an estimate of the correlation between the two latent variables determining the two ordinal observed variables if this correlation could be calculated. The probabilities of the contingency table for two variables x and y with m1 and m2 categories are calculated as (Holgado–Tello, Chacón–Moscoso, Barbero–García & Vila–Abad 2010, 155):

$$P[X = i, Y = j] = p_{ij} = \int_{a_{i-1}}^{a_i} \int_{b_{j-1}}^{b_j} \frac{1}{2\pi\sqrt{1-\rho^2}} e^{-\frac{(x^2-2\rho xy+y^2)}{2(1-\rho^2)}} dxdy \tag{4.7}$$

a_i and b_j are the cutoff values of the latent unobserved variables to decide the distribution of the observed ordinal variables. They are estimated in a first step as:

$$a_i = \Phi_1^{-1}(P_i) \tag{4.8}$$

$$b_j = \Phi_1^{-1}(P_j) \tag{4.9}$$

P_i and P_j are the observed cumulative marginal proportions of the contingency table of the two observed ordinal variables x and y (Flora & Curran 2004, 467-468).

Maximum likelihood offers a way of estimating the correlation by maximizing the following likelihood function:

$$lnL = \sum_{i=1}^{m1} \sum_{j=1}^{m2} n_{ij} log(p_{ij}) \tag{4.10}$$

This way of estimating the correlation matrix between the subjective health variables takes into account their ordinal nature. This is especially important as one item (worries about health) has only three categories which is too few to simply use Pearson correlation and treat the data as if it was continuous and normally distributed (Holgado–Tello et al. 2010, 154). This procedure results in a polychoric correlation matrix.

The polychoric correlation matrix should not be analyzed with standard maximum likelihood. Rather, research showed that a weighted least squares (WLS) approach also called asymptotically distribution free (ADF) is more appropriate (Flora & Curran 2004, Holgado–Tello et al. 2010). The fitting function for WLS is:

$$F_{WLS} = [s - \sigma(\Theta)]' W^{-1} [s - \sigma(\Theta)] \tag{4.11}$$

In STATA 12.1 this WLS approach is applied by using the sem option `method(adf)`. However, analyzing polychoric correlation matrices cannot be combined with a WLS estimation technique in STATA 12.1. Therefore, these analyses are the only ones where another statistics package is used. The software package for the estimation of the confirmatory factor analysis is MPlus 7 (Muthén & Muthén 2012).

4.4.2. Measurement Invariance

So far, I have discussed the appropriate way of measuring subjective health. I argued that a CFA approach suits the theory best. But there is another important reason to choose CFA. It allows testing whether there is reporting heterogeneity between men and women. This is an issue raised in the literature without a conclusive answer (see section A.4). Using a confirmatory factor analysis approach the question whether SRH means the same for men and for women can now be addressed using statistical methods. What I try to establish is measurement invariance (MI). Plainly speaking, establishing different forms of measurement invariance can answer the question whether and to what degree we are measuring the same concept for two groups. We can also determine if coefficients or scores can be compared between the groups or not (Bollen 1989). Measurement invariance is defined as:

> "Statistically, this means that the mathematical function that relates latent variables to the observations must be the same in each of the groups involved in the comparison. This idea has become known as the requirement of measurement invariance." (Borsboom 2006, S176)

Another definition is that

> "**measurement invariance (equivalence)** concerns whether scores from the operationalization of a construct have the same meaning under different conditions." (Kline 2010, 251) [emphasis in the original]

More informally speaking we can ask: Are we measuring the same thing in different groups? Does subjective health as measured by the indicators in the SOEP relate to the same construct in the same way for men and women? Do women on average rate their health lower? Is the curve relating indicator and latent variable steeper for men? These questions will be addressed. If these questions can be answered, then we can also address one of the issues from section 4.3.1. This refers to the question whether a comparison of effects from or on subjective health between men and women actually reflects substantive differences or only differences in

measurement.

There are five types of measurement invariance, which can be put in the order of the restrictiveness of their assumptions.

The first step is *configural invariance* (Kline 2010, 252) or *invariance of form* (Bollen 1989, 356). This means that the variables defined in the model, their measurement, and the structural relationships among them are theoretically the same. It does not imply that the strength of these relationships is the same. Put another way, we ask whether the constructs we define are measured by the same indicators for different groups. This step is most often skipped in the analysis if the theory dictates configural invariance. Only violations of the model fit in this least restrictive form of measurement invariance might change that.

The next step is to test for *metric invariance* (Kline 2010, 253). This is done by constraining the factor loadings of the model to be equal across groups. If this still yields a satisfactory model fit than we can conclude that the latent variable is constructed giving the same weight to the respective indicator. Showing that metric invariance holds is an important step, because it is a sufficient condition for comparing associations of the observed variable under scrutiny with other variables between the groups. This means that if I could establish metric invariance across gender we could compare correlations or regression coefficients of health with other labor market variables between men and women.
It should be noted that the unstandardized factor loadings are constrained to be equal, not the standardized ones. An issue with categorical dependent variables is that metric measurement invariance (section 4.4.2) cannot be tested apart from structural invariance, at least not without certain restrictions. The analysis of measurement invariance in the results part are nevertheless based on categorical dependent variables, because some research shows that treating these likert-scale items like continuous variables in group comparisons will result in misguided conclusions (Lubke & Muthén 2004). However, there will be no separate test for metric measurement invariance. Only structural invariance will be tested. As structural invariance implies metric invariance, this constitutes an even stronger test of comparability than required.

If we also want to compare the absolute level or means of a latent variable then we need to assume that the incepts of the indicators are equal across groups. This leads to *structural invariance* or *invariance of intercepts* (Bollen 1989, 365-366). If structural invariance can be accepted according to the model fit, we can conclude that there are no level differences in the indicators between groups, so that any remaining differences in the latent or observed variables should be due to substantive level differences, which cannot be explained by measurement or response differences. This means, that a given score on the latent variable will lead to the same response pattern on the observed indicators for both groups. There are no distortions through certain group specific response behaviors.

Tests of invariance can also be made for the variance of the error terms and the variance of the latent variable. These highly restrictive models are however not necessary for me to test whether subjective health measures the same thing for men and women in the SOEP. Consequently, I will not apply them here.

The elegance and usefulness of the approach of testing measurement invariance in CFA is the following. Many different studies in the literature have found different theoretical arguments and empirical findings to support or reject the hypothesis about comparability of subjective health status across gender. Measurement invariance relies on a latent variable approach which is in accordance with most of the theoretical approaches in the literature, but not with their empirical strategy. It allows to test the hypothesis stated, without relying on indexes of "objective" or "true" measures of health.

The reason why a confirmatory factor analysis is almost never applied might be that a lot of studies on reporting heterogeneity come from health economics. For reasons unclear, econometrics and psychometrics rarely deal which each other's approaches, although they can without a doubt be seen as the two driving forces in the development of applied statistical methods in the social sciences[4]. Perhaps the research questions and theoretical approaches are too different. Still I think that this is a loss, because the research question should determine the method used, rather than the discipline.

4.4.3. Comparing Fit in CFA Models - Tests and Model Fit Indices

4.4.3.1. The Problem of Model Fit Assessment Using CFA

The previous section spoke a lot about testing the data for the feasibility of different kinds of measurement invariance. But what are good tests and evaluation criteria for confirmatory factor analysis models? This question has and still does stir a lot of analytical and simulation based research (Kline 2010, 191). It is far beyond the scope of this dissertation to give a comprehensive review. As of today there is no one accepted criterion or set of criteria. I will explain which criteria are most often used and which I will use and what they signify. In the empirical application I will state whether or not certain criteria have been met. It should be kept in mind that all test statistics and fit indexes have their general and specific draw backs. That a model meets certain criteria does not prove that the model is right. It just lends support to the argument that it is the correct model (Kline 2010, 192). It is far easier to show that a certain model is misspecified than showing that it is correctly specified.

Fit statistics are only good indicators of average model fit, not of specific parts of the model. And each fit statistic reports one aspect of model fit. Fit statistics cannot tell you how and where you might have misspecified your model. Also, with good model fit does not necessarily

[4]Biostatistics also built the foundation for a lot of statistical methods used in social sciences nowadays, but it is not part of the social sciences.

come good predictive power of the model. And fit statistics have nothing to say about the interpretation or theoretical meaningfulness of a model (Kline 2010, 192-193).

Generally two classes of fit statistics can be distinguished: Model test statistics and fit indexes. Although they are treated separately, most fit indexes are a function of test statistics or vice versa (Kline 2010, 196). A test statistic tests whether the covariance matrix, which results from the model specified by the researcher, systematically deviates from the empirical covariance matrix found in the data. If such a test is found to be statistically significant, it means that it is unlikely that the deviations between theoretical and empirical covariance matrix are simply by chance or due to sampling error. One problem is that such an accept-support approach will generally yield more support for models with low statistical power and less support for models with high statistical power (Kline 2010, 193-194). If the sample is large (as it is using SOEP data) additional views on the model fit should be taken into account, because it is likely that a model is rejected because of large sample size and not because of poor model specification (Kline 2010, 198).

Fit indexes are not yes-or-no decisions in determining whether a model should be rejected or not, but rather continuous indicators of goodness or badness-of-fit of the model. They also indicate how closely the model resembles the actual data (Kline 2010, 195). One important group of fit indexes used in the literature are comparative fit indexes. These indexes compare the specified model with the baseline model, which is usually a model where there is complete independence of all variables. It means that one compares the specified model with probably the worst possible model and sees how it fares. This might not give any indication whether the model is good from an absolute standpoint.
Some indexes are adjusted for their (lack of) parsimony. That means that in one way or another the degrees of freedom in the model are taken into account. This pays tribute to the fact that more parsimonious models with higher degrees of freedom will ceteris paribus always have worse fit (Kline 2010, 196).
Absolute fit indexes are used to assess how much of the empirical covariance is explained by the model. They are similar to an R^2 statistic in ordinary regression (Kline 2010, 195).
So, are there any golden rules for model fit at all? The closest thing to golden rules for model fit assessment was the study undertaken by Hu & Bentler (1999). Still other studies point out that their cut-off criteria do not hold under all circumstances, some of them are quite realistic in real research. Therefore it is safe to say, that there are no golden rules (Kline 2010, 198).

4.4.3.2. Fit Statistics Used

For my purposes the following fit statistics are picked and interpreted jointly:

1. likelihood ratio χ^2 test
2. Root Mean Square Error of Approximation (RMSEA)
3. Comparative Fit Index (CFI)
4. Standardized Root Mean Square Residual (SRMR)

The RMSEA is a parsimony-adjusted badness-of-fit index where zero stands for the best fit. If the degrees of freedom are equal or larger than the χ^2 statistic of the model than RMSEA is zero. For all other models RMSEA is calculated by the formula (Kline 2010, 205):

$$RMSEA = \sqrt{\frac{\chi^2_M - df_M}{df_M(N-1)}}$$

With the point estimate of RMSEA comes a 90%-confidence interval. Ideally the lower bound should be zero. A rule of thumb is that a RMSEA ≤ 0.05 is a good fit and that the upper bound should not be above 0.10 (Kline 2010, 206).

The comparative fit index is calculated by the formula (Kline 2010, 208):

$$CFI = 1 - \frac{\chi^2_M - df_M}{\chi^2_B - df_B}$$

It assesses the χ^2-statistic of the model against the χ^2-statistic of the baseline model (independence model), correcting for the degrees of freedom, penalizing complex models. If CFI is 1 it indicates best fit. 0 would indicate that the model is as poor as the baseline model. The more it goes in direction of 0 the poorer the fit. CFI is robust to sample size which makes it a valuable information for my thesis (Kline 2010, 207).

The SRMR relies on the transformation of the predicted and the empirical covariance matrix into a correlation matrix. It measures the average absolute correlation residual. The cut-off criterion proposed by Hu & Bentler (1999) is 0.08.

4.5. The Unidirectional Approach: Fixed-Effects Logistic Regression

After I have discussed issues of causality and measurement of health I will now turn to the statistical methods used for the analysis of health effects on job status.
The theory of health selection predicts that persons in good health will have a higher chance

of getting into or remaining in a high status position on the labor market. In addition to social causation and health selection explanations the association of health and job status could also be due to third factors influencing both health and job status. Certain attitudes might lead to a healthier lifestyle and a better performance on the labor market. To avoid such biases in the estimation I will control for a wide range of theoretically relevant factors in my statistical models. Section 4.9.2 describes these variables and the rationale for choosing them. In this part, I will explain how time constant unobserved heterogeneity can be controlled in the models using a fixed-effects regression approach. Time constant unobserved heterogeneity is a technical term for all factors influencing e.g. health or job status which are constant over time for an individual. What remains are only factors which change over time. Kunze (2008, 66) points out that a fixed-effects approach for the estimation of wages has been a common approach since the study of Mincer & Polachek (1978). This section presupposes knowledge about standard OLS and logistic regression.

High status job is a dichotomous dependent variable. One way to treat such a variable adequately in a statistical model is to use a logistic function to link the probability of having a high status job (from now on *success* in contrast to *failure*) to the predictor variables. Trying to eliminate time constant unobserved heterogeneity (individual intercepts) works as follows. Similar to linear fixed-effects regression the starting point is an effects model, where a linear unobserved variable is estimated (Greene 2003, 690):

$$\begin{aligned} y_{it}^* &= X_{it}\beta + u_i + \epsilon_{it} \\ y_{it} &= 1 | y_{it}^* > 0, \\ y_{it} &= 0 | y_{it}^* \leq 0 \end{aligned}$$

For the random-effects approach u and e are assumed to be uncorrelated. For the fixed-effects approach, which is considered here, there is no assumption about the functional relationship between the two error terms. Using a rather complicated argument, it can be derived, that given a certain number of successes to the overall number of tries T, the conditional distribution of the dependent variable does not depend on the individual error term u_i. Formally speaking the following conditional probability

$$\frac{P(y_{i1} = y_1, ..., y_{iT} = y_T | X_i, u_i)}{P(n_i = n | X_i, u_i)}$$

can lead to a likelihood function which allows to estimate the coefficients β of the model (Wooldridge 2002, 491):

$$L(\beta) = \sum_{i=1}^{N} \log(exp(\sum_{t=1}^{T} y_{it} X_{it}\beta)[\sum_{a \in \mathbb{R}} exp(\sum_{t=1}^{T} \alpha_t X_{it}\beta)]^{-1})$$

The actual estimation process is implemented using STATA 12.1 with the command `xtlogit` and the `fe` option.

An alternative to the complicated fixed-effects-logit model is a linear probability approach. The simple linear probability model is defined as (Wooldridge 2002, 454):

$$P(y = 1|X) = X_{it}\beta$$

This is a linear approximation of a non-linear process. It should be noted, that by construction the model produces heteroscedasticity in the error-term, so that robust estimation techniques are warranted, but also easily implemented. The linear probability model can now be transformed like the common linear fixed-effects regression:

$$\hat{\beta}_{FE} = (\sum_{i=1}^{N} \sum_{t=1}^{T} \ddot{X}'_{it} \ddot{X}_{it})^{-1} (\sum_{i=1}^{N} \sum_{t=1}^{T} \ddot{X}'_{it} \ddot{y}_{it})$$

$$\ddot{y}_{it} = \ddot{X}_{it}\beta + \ddot{\epsilon}_{it}$$

The advantage is that it is easier to estimate, and that marginal effects are directly estimated, which is not possible in fixed-effects-logit model, where marginal effects depend on the not observed individual intercepts. These models can be estimated by using the STATA 12.1 command `xtreg` with the `fe` and robust option.
In the context of the cross-lagged panel fixed-effects linear probability model (see section 4.7) the estimation is done via STATA's `sem` package.

4.6. Applicants vs. Incumbents - The Use of Survival Analysis

In section 2.8.1 I proposed two hypotheses which stated that health selection might depend on whether a worker applies for a position or already holds it. In the one case it is the goal of the worker to move upwards on the job ladder. In the other case he or she wants to avoid moving downwards through demotion or being fired.
The fixed-effects-logit approach presented above cannot make this distinction in an empirical

test. Despite all its benefits one limitation is that a promotion and a demotion are treated the same in the statistical analysis. That means that - all else being equal - it does not matter for the estimation of the health coefficient whether a person is first in a regular job and then moves upward in the hierarchy to a high status position or whether it is the other way around. In addition, all those who stay in one of the two states for the whole period of observation are excluded from the analysis, because only *change* in job status is analyzed.
The method which is most appropriate to assess the hypotheses on applicants and incumbents are survival analytic models or so called event-history analysis. There is no one method for this purpose. There are dozens of different possible model specifications. What they have in common is that their basic level of analysis is the event time. This is the time from the beginning of the study (or the first observation of the individual) until the event occurs, until the study ends, or until the individual leaves the study in which case this observation is said to be right-censored (Singer & Willett 1993, 157).

Deciding which model to estimate is not easy. Generally, a rough distinction between parametric, semi-parametric, and non-parametric approaches can be made. I will choose a non-parametric approach which does not make any assumption about the functional form of either the analysis time or of the hazard-function. There is no theory indicating any kind of functional assumption, so that a non-parametric approach seems the safest and most conservative choice.
I follow the model presented by Singer & Willett (1993) as a discrete-time survival analytical model. The discrete-time hazard (h), indicating the probability for a randomly chosen individual that the event happens at a certain time period j, given that the event has not already happened, is defined as (Singer & Willett 1993, 163):

$$h_j = Pr(T = j|T \geq j) \tag{4.12}$$

T stands for the random variable which indicates the period in which the event happens. Introducing a matrix of observable characteristics (Z) and defining the probability for individuals yields the following definition (Singer & Willett 1993, 164):

$$h_{ij} = Pr(T_i = j|T_i \geq j, Z_{1ij} = z_{1ij}, Z_{2ij} = z_{2ij}, ..., Z_{Pij} = z_{Pij}) \tag{4.13}$$

P stands for the number of predictors in the model. This is identical to the number of independent variables in the model. Using a logistic function to link these probabilities and the predictors the discrete-time hazard model is (Singer & Willett 1993, 166):

$$h_{ij} = \frac{1}{1 + e^{-[(\alpha_1 D_{1ij} + \alpha_2 D_{2ij} + ... \alpha_J D_{Jij}) + (\beta_1 Z_{1ij} + \beta_1 Z_{1ij} + ... + \beta_P Z_{Pij})]}} \tag{4.14}$$

J is the last time period observed in the whole sample. D stands for dummies which index time periods ($d_{1ij} = 1, if f j = 1$, etc.). α are the intercept parameters, β the slope parameters describing the effect of the variables in the model on the hazard function on a logistic scale.

$$log(\frac{h_{ij}}{1-h_{ij}}) = (\alpha_1 D_{1ij} + \alpha_2 D_{2ij} + ...\alpha_J D_{Jij}) + (\beta_1 Z_{1ij} + \beta_1 Z_{1ij} + ... + \beta_P Z_{Pij}) \quad (4.15)$$

This equation shows that the scale of the model will be log-odds, the same as it was with the fixed-effects-logit approach (Singer & Willett 1993, 167).
The likelihood function that allows the estimation of the relevant parameters is derived in the following way. The likelihood is simply the product of the probabilities of observing the events and censored individuals (c) as the data presents it (Singer & Willett 1993, 170):

$$L = \prod_{i=1}^{n} [Pr(T_i = j_i)]^{1-c_i} [Pr(T_i > j_i)]^{c_i} \quad (4.16)$$

This can be transformed to:

$$L = \prod_{i=1}^{n} [h_{ij} \prod_{j=1}^{j_i - 1} (1 - h_{ij})]^{1-c_i} [\prod_{j=1}^{j_i} (1 - h_{ij})]^{c_i} \quad (4.17)$$

Taking the logarithm and skipping some substitutions and transformations, we get (Singer & Willett 1993, 170):

$$l = \sum_{i=1}^{n} \sum_{j=1}^{j_i} [log(\frac{h_{ij}}{1 - h_{h_{ij}}})^{y_{ij}} + log(1 - h_{ij})] \quad (4.18)$$

where y_{ij} stands for the event occurring or not.

The models estimated in section 5.6 are all applications of this non-parametric discrete-time survival analysis. They are implemented by transforming the SOEP into a survival data set and estimating the model with STATA 12.1 using the command `logit` allowing for repeated events within an individual by calculating standard errors corrected for within individual-correlated error terms and allowing for hetereoskedastic error distribution with the option `cluster`.

4.7. Testing Selection vs. Causation

In my literature review part I argued that one feature of a "good practice" study is that health selection is directly tested against a social causation explanation. Following my own advice I will use a method which has been used in a couple of "good practice" studies (e.g. Chandola

et al. 2003, Eaton et al. 2001, Stansfeld et al. 2011). The method can be called cross-lagged panel model within a structural equation modeling (SEM) framework. The idea behind this approach is to see whether health (at time point t) has a significant impact on job status at time point t+1 beyond what is explained already by job status and control variables at time point t. The same goes the other way around for the impact of job status at t on health at t+1. The concept is captured in figure 4.2.

I modify the model used in the literature by controlling for unobserved time constant heterogeneity with a fixed-effects approach (compare section 4.5). I use standard demeaning strategy to make the estimated coefficients independent of the individual intercepts. As this is a linear regression approach and job status is a dichotomous variable this results in a linear probability model (LPM, see again section 4.5). Taken all together the model could be described with the monstrous term *cross-lagged panel fixed-effects regression including a linear probability model*. I will simply use the term "cross-lagged fixed-effects" (CL-FE) as it contains the most important features of the model. For the interpretation of the coefficients it is key, however, to remember that the equation with job status as dependent variable is treated as a linear probability model.

The advantage of ignoring non-linearity in the model is that marginal effects are estimated. From the marginal effects we can get an impression of the absolute strength of the effects. Such an assessment is harder in a logistic regression model.

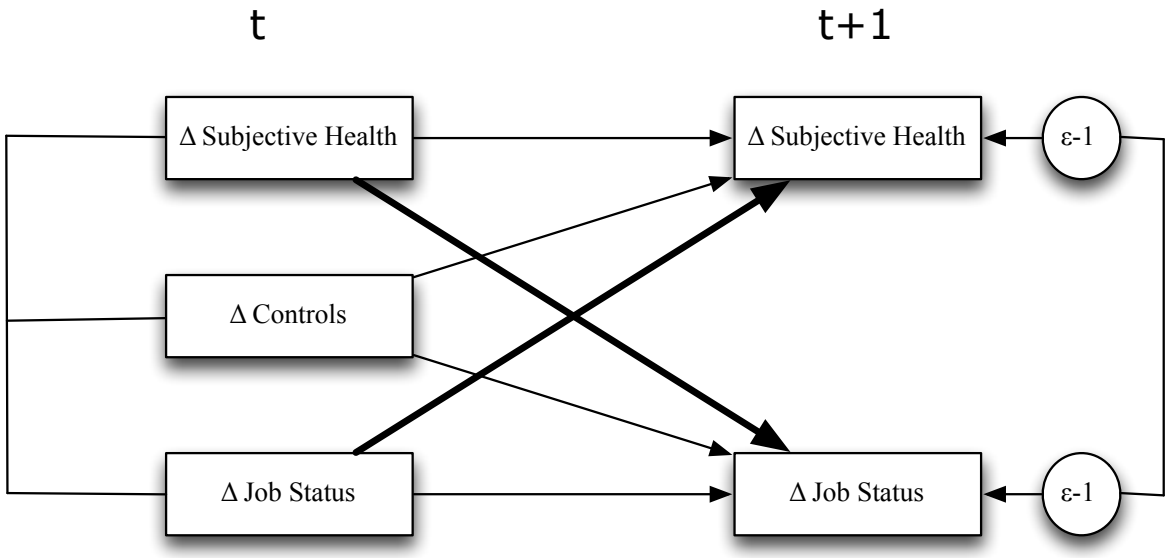
Formally the conceptual model is described by two equations:

$$\ddot{y}_{it+1} = \ddot{z}_{it}\beta + \ddot{X}\delta_1 + \ddot{\epsilon}_{it}$$
$$\ddot{z}_{it+1} = \ddot{y}_{it}\gamma + \ddot{X}\delta_2 + \ddot{\mu}_{it}$$

The dots indicate that the variables have been demeaned to exclude individual intercepts from the equation. X is a vector of control variables. The error terms of the two equations are allowed to be correlated to captured any remaining influence which might else lead to estimates biased due to spurious correlation.

A slight deviation from the standard approach in the literature is that the effects of the variables at t on variables t+1 are constrained to be equal across all waves. This assumption is also found in common fixed-effects regression. This disallows time trends in effect sizes. As time trends are not the subject of investigation here, a simplification of the model will lead to an easier interpretation. Leaving the coefficients to be freely estimated does not change any of the presented results in substantive terms.

Figure 4.2.: A Cross-Lagged Model with Fixed-Effects



4.8. Decomposition of Health Inequalities

In the literature the question is often posed to what degree health inequalities can be explained by different factors. In my case, I ask to what degree the overall differences in health between normal and high status job workers can be attributed to:

a) spurious correlation due to common background factors

b) materialist-environmental factors

c) social-psychological factors

d) health selection

At the same time, I attempt a decomposition into time varying and time constant factors.
I will show that the approach which is taken by several studies (Kroh, Neiss, Kroll & Lampert 2012, Richter, Moor & Lenthe 2012, Vonneilich, Jöckel, Erbel, Klein, Dragano, Siegrist & Knesebeck 2012, Christensen, Labriola, Lund & Kivimäki 2008, Ball, Crawford & Mishra 2006, Thrane 2006, Warren, Hoonakker, Carayon & Brand 2004, Cohen & Hamrick 2003, Stronks, Mheen, Bos & Mackenbach 1997) does not yield the correct decomposition. In addition, I am able to provide confidence intervals for the decomposition. I do not develop a new method, I simply apply the well known path analysis and calculation of indirect effects based originally on Wright (1934). The calculation of the standard errors for these indirect effects follows Sobel's method (Sobel 1987), which can be implemented in most recent major statistical software packages. I use STATA 12.1's `sem` and `estat teffects` commands for this purpose.
The argument below is made for the case of linear regression for simplicity's sake. The same

problem and solution are also true for logistic regression and probit regression. In these cases things are additionally complicated by the fact that the scaling of the coefficients changes when additional variables are considered in the model. This is a problem which is also rarely addressed in applied research (Mood 2010, Karlson, Holm & Breen 2012).

I begin by outlining the approach often taken in the health inequalities research literature and then show how it can be improved. Further, in the subsequent section I provide - to the best of my knowledge - the first attempt in the health inequalities literature at a decomposition of an effect (not a variable!) into time constant and time varying parts. I provide an estimate of the mediation effect of all time constant factors including a confidence interval. Respective statistics are provided for time varying factors.

Before I start, I must stress that this decomposition approach makes no claims to causal interpretation. This is a difference to some of the previous approaches presented. Although in some cases models are estimated which could imply causation from health to some of the mediators these "effects" should not be interpreted causally. What is done is merely a decomposition of the health effect according to factors with which health and job status are associated. In some instances I will use the term mediation. This is not meant as mediation in the causal sense, but in a technical sense. It simply describes how the model is estimated not how the causal direction runs. For example, it makes no sense to claim that health during the labor market period has an influence on education, which was attained before entering the labor market. And of course age as a dependent variable is only reasonable for technical purposes.

Traditional approaches in the wider field of medical sociology, public health, and epidemiology have tried to decompose health inequalities in the following way. First, a bivariate regression (sometimes adjusted for age) is estimated. Then successively additional variables are added to the model. The difference in the new estimated coefficient of the variable of interest (e.g. income) in comparison to the bivariate case is interpreted as health inequalities due to income, which can be explained by other factors such as health behavior or education. This allows statements like: *25% of income related health inequalities can be traced back to differences in education, and 40% to differences in health behavior between income groups. The rest of the health effect (35%) remains unexplained or is the direct effect of income on health.*

These statements are scientifically interesting and useful, because they address substantial questions of research in health inequalities and can be easily understood by those who are not trained in statistics, reaching a wider audience. It follows that I want to retain the ability to make such statements when modifying existing approaches. My argument is divided into three steps. First, I show that the reported percentage points are only in very specific cases the correct estimates. Second, I provide a measure of uncertainty of these estimates in form of a confidence interval, which is well known from conventional parameter estimates. Third, I show such statements can be made for time constant factors and for time varying factors.

Intuitively the argument is as follows. The change in the coefficient of the independent variable of interest (x_1) can only be attributed to other factors in the way presented above if the additional variables which are introduced are uncorrelated in the sample or if the variables are completely unrelated to the outcome (y_4), in which case their contribution to the explanation of health inequalities is of course zero. In this case each change actually presents the portion of the coefficient attributable to the newly introduced (set) of variables (always 0). As soon as the newly introduced variables (y_1, y_2, y_3) are correlated in the sample with x_1 the order in which they are added to the model becomes a determinant for the change in the coefficient of x_1 on the outcome (y_4). In most cases the change in the coefficient of x_1 will be different if the order is altered.

Several studies recognize this and consequently use every possible combination of three variable blocks (only y_1 or y_2 or y_3, y_1 and y_2, y_1 and y_3, y_2 and y_3, all three). They interpret the change of the coefficient if only one of the three blocks is included as the raw mediation. The change in the coefficient from the model which includes already two variable blocks to the model with all variable blocks is interpreted as the independent contribution of the variable set which is included last. The difference between the two values is characterized as the contribution due to correlation with the two other variable sets. This is a better way of addressing the issue, but it is unfortunately still not correct. It recognizes the problem, but fails to provide the correct solution.

If y_1 and y_2 and y_3 are all uncorrelated in the sample their own direct effects on the outcome will be the same regardless whether only one of the variables, two or all three are included in the model. However, if they are correlated the coefficients of both x_1 and the other variables in the model (e.g. y_1 and y_2, with y_3 excluded) are biased in the reduced model. x_1 is conditioned on one variable, but not using the correct coefficient. This results in a biased *conditional estimate*. Therefore the difference in effects of x_1 between a reduced model and the full model will under these circumstances not yield the correct mediation effect.

A fictional example might look like this: If first y_1 is introduced in the equation and this reduces the coefficient by 25% and then y_2 which results in an additional reduction of 10% we just know that *jointly* the reduction is 35%, but the individual contribution could be anything. It is not even restricted to the bounds of 10% and 35%. Conditioning on y_2 could lead to a sign switch in the coefficient of y_1 leaving it with an actual negative[5] contribution, or the coefficient could be close to zero after controlling for y_2 which leads to no independent contribution. In almost all empirical cases, we cannot tell beforehand. We have to calculate the indirect effects through path analysis.

At this point it should also be noted that if only one variable or one set of variables is used for mediation, the traditional method is still valid. This means that the difference between the full model and the model only including x_1 can be interpreted as the mediating effect of all set of

[5]This would indicate that health inequalities are actually increased when controlling for y_2. See table 4.1.

variables together.

After this rather intuitive argument I will show formally that the common approach in the literature is incorrect. The model that includes x_1 and all additional sets of variables has to be seen as the correctly specified model. If it is not, then all further claims about any relationship become void. The full model provides an estimate of all direct effects on the outcome conditioned on all other variables. The actual mediation effect is now the product of the regression coefficient of e.g. y_1 on x_1 times the coefficient of x_1 in the final model.

The full model is:

$$y_4 = \alpha_{y_4} + \gamma_{direct}x_1 + \beta_1 y_1 + \beta_2 y_2 + \beta_3 y_3 + e_{y_4} \tag{4.19}$$

The additional equations which are implicit, but should be made explicit are:

$$y_1 = \alpha_{y_1} + \gamma_1 x_1 + e_{y_1} \tag{4.20}$$

$$y_2 = \alpha_{y_2} + \gamma_2 x_1 + e_{y_2} \tag{4.21}$$

$$y_3 = \alpha_{y_3} + \gamma_3 x_1 + e_{y_3} \tag{4.22}$$

The total effect of x_1 on y_4 is simply the covariance divided by the variance of x_1 or it could be written as the sum of all indirect effects and the direct effect (Bollen 1989):

$$\gamma_{x_1 total} = \frac{cov(x_1, y_4)}{var(x_1)} = \gamma_{direct} + \gamma_1\beta_1 + \gamma_2\beta_2 + \gamma_3\beta_3 \tag{4.23}$$

A model which now excludes one of the mediators (y_3) would look like this:

$$y_4 = \alpha_{y_4} + \gamma_{\grave{direct}}x_1 + \grave{\beta}_1 y_1 + \grave{\beta}_2 y_2 + \grave{e_{y_4}} \tag{4.24}$$

The claim that would need to be made if the approach in the literature was correct is that:

$$\gamma_{\grave{direct}} - \gamma_{direct} = \gamma_3\beta_3 \tag{4.25}$$

Only in this case would we get a correct estimate of the effect of x_1 on y_4 which is mediated by y_3. However, rearranging equation 4.23 and inserting it in 4.25 yields:

$$\gamma_{\grave{direct}} = \gamma_{x_1 total} - (\grave{\beta}_1\gamma_1 + \grave{\beta}_2\gamma_2) \tag{4.26}$$

$$\gamma_{direct} = \gamma_{x_1 total} - (\beta_1\gamma_1 + \beta_2\gamma_2 + \gamma_3\beta_3) \tag{4.27}$$

$$\gamma_{\grave{direct}} - \gamma_{direct} = \gamma_3\beta_3 + \gamma_1(\beta_1 - \grave{\beta}_1) + \gamma_2(\beta_2 - \grave{\beta}_2) \tag{4.28}$$

So we can see that the difference in the two coefficients estimated the conventional way usually does not yield the correct mediating effect. Only if either both γ_1 and γ_2 are zero or both $\beta_1 = \grave{\beta}_1$ and $\beta_2 = \grave{\beta}_2$ is true does the conventional method estimate the correct mediating effect. This means that either x_1 has to be completely unrelated to both y_1 and y_2 making them effectively useless mediators, or y_3 is uncorrelated with y_1, y_2, and x_1 (compare Wooldridge 2009, 92) making it again an entirely useless mediator.

We can see that the conventional approach fails to give us the correct answer with regard to strength of mediation. In addition, it is not clear in what direction the results will be biased. It could be either a downward or an upward bias. The sign could even switch depending on the signs and the relative sizes of the terms $\gamma_3\beta_3$ and $\gamma_1(\beta_1 - \grave{\beta}_1) + \gamma_2(\beta_2 - \grave{\beta}_2)$. It seems therefore best to use a path model to estimate mediator effects. Fortunately this technique has been around in applied social science research for decades now and is easy to implement in various software packages. In addition, the standard errors for the indirect effects are usually provided using the delta-method (Sobel 1987). This allows us to calculate a confidence interval for the proportion which is explained by the mediator. The proportion for the jth mediator with k total mediators is calculated as (confidence interval in brackets):

$$Prop_{y_j} = \frac{\gamma_j\beta_j}{\gamma_{total}} = \frac{\gamma_j\beta_j}{\sum_{j=1}^{k}(\gamma_j\beta_j) + \gamma_{direct}} \tag{4.29}$$

$$[\frac{\gamma_j\beta_j - 1.96 * se(\gamma_j\beta_j)}{\sum_{j=1}^{k}(\gamma_j\beta_j) + \gamma_{direct}}; \frac{\gamma_j\beta_j + 1.96 * se(\gamma_j\beta_j)}{\sum_{j=1}^{k}(\gamma_j\beta_j) + \gamma_{direct}}] \tag{4.30}$$

We should also note that the estimate of the mediation effect is not bounded by 0 and 1 (or 100%). All values are theoretically possible. Table 4.1 explains what the different value ranges mean:

Table 4.1.: Meaning of Different Value Ranges of Decomposition - in Percent

Value of $Prop_{y_j}$	Meaning
0-1	The remaining effect is X∗100% **smaller** than the total effect. Conditional health inequalities are reduced compared to unconditional health inequalities.
> 1	The remaining effect is (X-1) times the size of the total effect and the **sign has switched**. Conditional health inequalities are inverted when compared to unconditional health inequalities.
< 0	The remaining effect is $\|X\|$ times **larger** than the total effect. Conditional health inequalities are increased in comparison to unconditional health inequalities.

4.8.1. Indirect Effects Through Time Constant Factors

In this part, I will explain how I estimate which contribution time constant factors make to the explanation of health inequalities. Such an estimate can answer the important question as to what degree health inequalities are actually subject to change during the period of observation (which is mainly the adult work life). If time constant factors mediate a lot of the cross-sectional observed health inequalities this means that there is little change and reduced chances for interventions trying to reduce health inequalities. It also means that job status in itself does not have a strong beneficial or harmful influence on health. If time constant factors are mainly responsible for health inequalities in job status, interventions need to take place before the period of observation which means before individuals actually enter the labor market. Else only the symptoms can be treated, not the cause of health inequalities. On the other hand if time constant factors play a minor role, health inequalities might be more susceptible to change and intervention.

A decomposition of the health inequalities into time constant and time varying factors is of course only possible with longitudinal data. I start by considering the general panel regression model and the estimate of gross health inequalities through a cross-sectional OLS regression:

$$y_{it} = X_{it}\gamma_{OLS} + e_{it} \tag{4.31}$$

$$y_{it} = X_{it}\gamma_{FE} + u_i + \epsilon_{it} \tag{4.32}$$

u_i represents the time constant factors which might partly be unobserved. We want to explain to which degree γ_{OLS} can be explained by u_i. The problem is that we do no observe u_i. To solve this problem, I have to use a trick. First, I consider the fixed-effects transformation

of the equation which is usually used to analyze within-person variance. It works through demeaning all variables. That means subtracting the individual mean from each observation.

$$y_{it} - \bar{y}_i = (X_{it} - \bar{X}_i)\gamma_{FE} + (u_i - \bar{u}_i) + (\epsilon_{it} - \bar{\epsilon}_i) \tag{4.33}$$

Usually this is just a stage in the transformation where it can be shown that the unobserved time constant part of the equation drops out. Then the difference between γ_{OLS} and γ_{FE} could be interpreted as the part of γ_{OLS} attributable to time constant factors. However, we would not be able to get a measure of uncertainty in form of a confidence interval this way. One small rearrangement and a reinterpretation of the equation will give us the opportunity to estimate the indirect effects of health on job status via time constant factors with confidence intervals.

$$y_{it} - \bar{y}_i - (X_{it} - \bar{X}_i)\gamma_{FE} - (\epsilon_{it} - \bar{\epsilon}_i) = (u_i - \bar{u}_i) \tag{4.34}$$

$$y_{it} - X_{it}\gamma - \epsilon_{it} = u_i \tag{4.35}$$

$$\bar{y}_{it} - \gamma X_{it}\gamma - \bar{\epsilon}_{it} = \bar{u}_i \tag{4.36}$$

$$u_i = \bar{u}_i \tag{4.37}$$

$$\bar{\epsilon}_{it} = 0 \tag{4.38}$$

The panel model explicitly decomposes the error-term into a time constant component (u_i) which is basically the mean of the error within the person, and one error component which is the time dependent deviation from this error term with an intra-individual expectation of zero. Note that the equation $\bar{\epsilon}_{it} = 0$ is true by definition. Combining and rearranging equations 4.36, 4.46, and 4.38 we get:

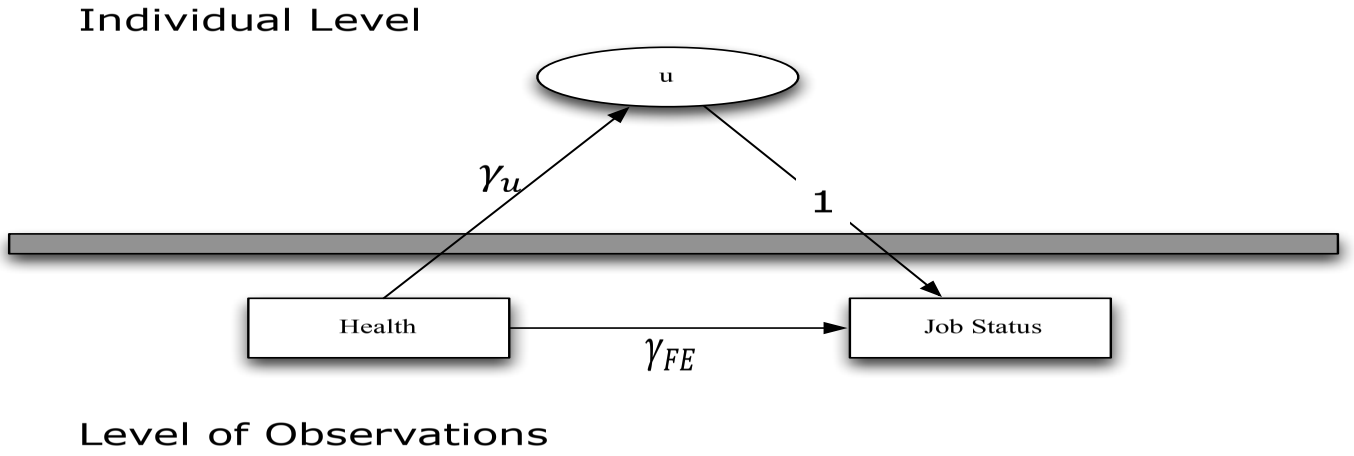
$$y_{it} = X_{it}\gamma_{FE} + (\bar{X}_i * -\gamma_{FE}) + \bar{y}_i + \epsilon_{it} \tag{4.39}$$

This equation can be interpreted as follows: The dependent variable depends on X times the coefficient from the fixed-effects-transformation (γ_{FE}) plus the means of X times the fixed-effects-coefficient which has the opposite sign ($-\gamma_{FE}$), plus the mean of the dependent variable without a coefficient (which is equal to a coefficient fixed at 1) and a time varying residual term.
From this we can calculate the indirect effect of X_{it} through time constant factor u_i. It is the effect which is mediated through $\bar{X}_i$ and $\bar{y}_i$. The total effect is then the indirect effect through time constant factors γ_{TC} plus the indirect effect through time varying factors γ_{TV} plus the direct effect of the time varying part of X_{it} which is equal to the fixed-effects-estimate

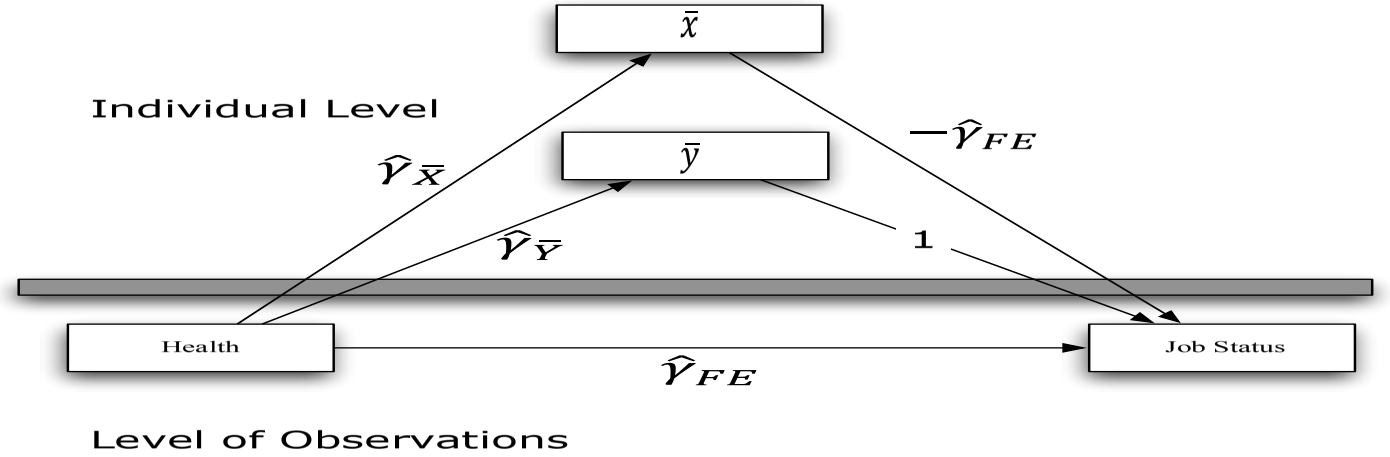
($\gamma_{direct} = \gamma_{FE}$). Mediation through other time varying variables is the same as normal mediation explained in the previous part. To keep things simple, it is disregarded here.

Figure 4.3.: Indirect Effect of Health Through Time Constant Factor u

(a) Before FE transformation - u is unknown



(b) After FE transformation - u is estimated through means



In the following, I will analytically proof my approach. The approach is also presented graphically in figure 4.3.

Proposition 1: The indirect association of X and Y through time constant X and time constant Y is an unbiased estimator of the indirect association of X and Y through the unobserved time constant factor u.

$$E(\hat{\gamma}_{\bar{y}} - \hat{\gamma}_{\bar{X}}\hat{\gamma}_{FE_X}) = \gamma_u \tag{4.40}$$

I denote averages within individuals (over time) with bars (Greene 2003, 293).

$$\bar{X}_i = \frac{\sum_{i=1}^{T_i} X_{it}}{T_i} \tag{4.41}$$

$$\bar{y}_i = \frac{\sum_{i=1}^{T_i} y_{it}}{T_i} \tag{4.42}$$

Where T_i is the number of observations per individual which is allowed to vary over individuals making the whole method feasible for both balanced and unbalanced panels. Large COV, and VAR indicate population parameters while small cov, and var indicate sample parameters. Assumptions:

$$y_{it} = X_{it}\gamma_{FE_X} + u_i + e_{it} \tag{4.43}$$

$$E(\bar{e}_i) = 0 \tag{4.44}$$

$$u_i = \bar{u}_i \tag{4.45}$$

It follows that:

$$u_i = \bar{y}_i - \bar{X}_i\gamma_{FE_X} \tag{4.46}$$

For more details on this see Greene (2003, 288). The definition of the true association of X with u in the population is:

$$\gamma_u = \frac{COV(X,u)}{VAR(X)} \tag{4.47}$$

This is also the mediated effect of the independent variable through time constant factors.

Indexes are left out for convenience. Proof:

$$E(\hat{\gamma}_{\bar{y}} - \hat{\gamma}_{\bar{X}}\hat{\gamma}_{FE_X}) = E(\frac{cov(X,\bar{y})}{var(X)} - \frac{cov(X,\bar{X})}{var(X)}\hat{\gamma}_{FE_X}) \tag{4.48}$$

In the first step we just rewrite the covariance in terms of expected values:

$$= E(\frac{E(X\bar{y}) - E(X)E(\bar{y}) - E(X\bar{X})\hat{\gamma}_{FE_X} + E(X)E(\bar{X})\hat{\gamma}_{FE_X}}{var(X)}) \tag{4.49}$$

Then we take the expected value of the fraction. The expected value of the expected values in the term yields again the expected values. The expected value of the fixed-effects coefficient estimate is the fixed-effects population coefficient (γ_{FE_X} instead of $\hat{\gamma}_{FE_{\bar{X}}}$). The expected value of the sample variance of X (var(x)) is the population variance of X (VAR(X)).

$$= \frac{E(X\bar{y}) - E(X)E(\bar{y}) - E(X\bar{X})\gamma_{FE_X} + E(X)E(\bar{X})\gamma_{FE_X}}{VAR(X)} \tag{4.50}$$

Now I rearrange the equation, so that in the next step equation 4.46 can be used.

$$= \frac{E(X(\bar{y} - \bar{X}\gamma_{FE_X})) - E(X)E(\bar{y} - \bar{X}\gamma_{FE_X})}{VAR(X)} \tag{4.51}$$

I substitute according to equation 4.46. The reformulation of the covariances terms will lead us to the parameter of interest.

$$= \frac{E(Xu) - E(X)E(u)}{VAR(X)} \tag{4.52}$$

$$= \frac{COV(X,u)}{VAR(X)} \qquad = \gamma_u \tag{4.53}$$

which is what I wanted to proof. This is the analytic proof for Proposition 1.
What that means is that as long as we have panel data we can use the individual averages of all independent variables and the dependent variable to estimate the indirect association of a specific independent variable with the dependent variable which is due to factors that are time constant during the period of observation. The proof does not make any assumptions about whether the panel is balanced or unbalanced, so the method works in both cases.
For the case of health inequalities this allows us to assess to what degree health inequalities are changeable over time, and to what degree they are already fixed by the time the observation starts.

The proportion of the effect due to time constant factors is thus:

$$Prop_{y_{TC}} = \frac{\gamma_{TC}}{\gamma_{total}} = \frac{(\gamma_{\bar{y}} + \gamma_{\bar{X}}\gamma_{FE})}{(\gamma_{\bar{y}} + \gamma_{\bar{X}}\gamma_{FE}) + \gamma_{TV} + \gamma_{direct}} \tag{4.54}$$

Confidence intervals are calculated analog to the previous section using the delta-method.

4.9. Data, Variables, and Measurement of Controls

After the detailed discussion of the statistical models, I turn to the description of the dataset and the measures I use.

4.9.1. The Socio-Economic Panel Study - SOEP

I use data from the German Socio-Economic Panel Study (SOEP) to conduct my analyses. The SOEP is a representative household survey with annual interviews since 1984. The survey currently includes more than 20,000 individuals in more than 10,000 households (see Wagner, Frick & Schupp 2007). The data for the regression analyses contains the waves P (1999) to BB (2011). I restrict my sample in the following way:

- Only currently employed persons
- No persons in vocational or educational training
- Aged between 18 and 64
- No self-employed

As a measure of health problems, which are directly visible to the employer, I use days of sickness absence in the last year. I take the logarithm of the (measure + 1), because I believe that the first days of sickness absence will have a stronger impact on labor market rewards than later increases. That means that a change from zero to 5 days has a stronger influence than a change from 20 to 25 days of sickness absence.
An individual is defined as being in a high status job if he or she reports that he or she has a job that required either highly specialized skills or supervisory tasks, or both.

4.9.2. Control Variables

My theory of health selection builds on a simple yet elegant model of labor market rewards by Becker (1985). It states that LMR are not only determined by health, but other factors as well. Those are the following:

1. Human capital (α)
2. Labor market effort (t)
3. Non-labor market effort (E_{NLM})
4. Effort intensity of the job (σ)

in addition I will control for:

5 Demographic factors and period effects

6 Anticipation of status change (A_{LMR})

I will briefly describe each indicator used to capture these constructs. Table 4.2 lists all those variables as an overview. In the results section (5.1), tables 5.3 and 5.4 describe the sample statistics of the control variables.

Human capital (α) is measured mainly by the years of education an individual has received. It could be argued that within the German context it makes more sense to control for certain educational titles. As it is not the aim of this thesis to estimate any educational effects, a more parsimonious measurement seems appropriate. In addition, the years of tenure with an employer and years of full-time labor market experience are important indicators for human capital, both general/occupational and company-specific human capital. As another measure the current wage is used as an indirect measure of job quality and skill.
Labor market effort (t) is measured through work hours which are agreed upon in the contract (if this figure is not available, the actual hours of work are used) and the amount of reported overtime. *Effort intensity* (σ) relies on a measure of physical and psychological strain of the job based on the occupational classification (Kroll 2011), as well as firm size and the industry of the employer.
Non-labor market effort (E_{NLM}) is captured by the household size, the number of children below 16 in the household, the hours spent on childcare and housework each weekday, and the marital status.
Demographic factors are controlled through age, age squared, and a dummy for East Germany.
Anticipation effects (A_{LMR}) are covered by an item on worries about job security and an item that captures worries about the own economic situation and satisfaction with the own work.

The theoretical formulation for these measures is:

$$LMR = \alpha(e(H(A_{LMR}), E_{NLM}) * \tau)^{\sigma} t \tag{4.55}$$

Table 4.2.: Description of Control Variables

Variable	Description	Reference to construct in theory
Anticipation of job loss		
Worries about job security	Dummy variable indicating strong vs. low/no worries	A_{LMR}
... own economic situation	Dummy variable indicating strong vs. low/no worries	A_{LMR}
Satisfaction with work	11-point scale	A_{LMR}
Human capital		
Education	Years of formal education	α
Job tenure	Years of job tenure	α
Labor market experience	Years of full-time labor market experience	α
Wage	Log gross labor income (monthly)	α
Labor market effort and effort intensity		
Industry	Industry of employer (NACE Rev.1.1), 10 categories: *Agriculture and Fishing; Mining and Manufacturing;*	σ
	Energy and Water Supply; Construction; Wholesale, Hotel and Restaurant; Transportation and Information;	σ
	Financial Intermediate; Real Estate, Law Counseling; Public Administration; Public and Private Services	σ
Firm size	Size of firm, 5 categories: <5; 5-19; 20-199; 200-2,000; >2,000	σ
Work hours	Contractual hours of work per week	t
Overtime	Reported hours of overtime per week	t
Effort intensity (physical)	Variable indicating relative physical strain of occupational group (deciles)	σ
Effort intensity (psychological)	Variable indicating relative psychological strain of occupational group (deciles)	σ
Non-labor market effort		
Number of HH members	Number of persons in the household	E_{NLM}
Number of children	Number of children in the household	E_{NLM}
Marital status	A persons marital status, 3 categories: *married; single; other*	E_{NLM}
Housework and Childcare	Hours of housework and childcare per day	E_{NLM}
Youngest HH member	Age of youngest person in the household	E_{NLM}
Demography and period effects		
Period effects	Dummy variables for three year periods	
Age	Age in years	
Age^2	Age squared	
East Germany	Dummy variable indicating if a person lives in East Germany	

4.10. Measuring Social Closure on the Labor Market

In this part, I will explain how I operationalize the concept of open and closed positions. More precisely, I measure the degree of closure at the occupational level in two ways.

4.10.1. "Glass-Escalators" and Token Positions

The theory of Kanter (1977) states that individuals in so called token positions face difficulties on the job as soon as they are aiming for promotion. At the same time the theory of Williams (1992) claims that men are easier promoted in female dominated jobs, riding a figuratively speaking "glass-escalator".

In my study I will use the same measurement as in Hultin's (2003) study. She divides the occupations into three types. Those with less than 30% women are defined as *male dominated*. Those occupations with more than 70% women are called *female dominated* occupations. All occupations in-between are referred to as *mixed occupations*.

I use data from the German Federal Statistical Office (FSO) on gender proportions in occupational groups of the KLDB-92 classification of the FSO on the 3-digit level. These proportions were calculated based on the *Mikrozensus*, a yearly 1% sample of the German population.

Table 4.3 shows how men and women are distributed among those three categories of occupations. The results are valid for the restricted sample described in section 4.9, weighted to make the descriptives representative for the whole population which falls under the mentioned restrictions. 68% of the men work in male dominated occupations, 24% in mixed occupations, and only a little less than 8% work in female dominated occupations. 56% of the women work in female dominated, 34% work in mixed, and around 10% work in male dominated occupations. The distribution is a little more skewed for men than for women, but all in all nothing out of the ordinary, given the definition of the groups.

Table 4.3.: Proportion of Men and Women According to Hultin's Classification of Occupations - in Percent

	Male dominated	Mixed	Female dominated
Men	68.32	23.90	7.77
Women	10.13	33.72	56.15

4.10.2. Professionalism - Knowledge Intensity of Occupations

One way of merging the closure mechanisms of credentialism and professionalism in one empirical measure is knowledge intensity of occupational groups. To the best of my knowledge

this has not been used so far within the research on occupational closure. The idea, the concept, and the measurement are taken from Tiemann (2010). All descriptions presented here refer to this study where the whole concept and measure is described in more detail. The intent is to define occupations as knowledge intensive if they have high requirements on their workers regarding the following four activities (Tiemann 2010, 11):

- Development and Research
- Investigation and Documentation
- Training and Teaching
- Organizing flow of work or operational procedures of other persons

The level of aggregation for the measure of knowledge intensity is occupational groups based on a 3-digit coding of the occupational classification of the FSO, same as for proportion of women in occupations described in the previous section. The measure is based on a survey of employees from the years 1999 and 2006 conducted by the Institute for Labor Market and and Occupational Research (IAB). Questions about the activities stated above were used to code a variable of knowledge intensity which ranges from 0 to 1. It represents the proportion of employees in an occupational group which reported high demands with regard to knowledge intensive activities. Zero means that no employee reported high demands, 1 means all employees report high demands with regard to knowledge intensive activities. For a detailed list of the occupations and their degree of knowledge intensity see the study by Tiemann (2010).

5. Results

5.1. Sample Description

In this part, I will give an overview of the sample statistics of the sample used for estimation. First, I show the sample size for the years under investigation and show how the sample is affected by the restrictions made in section 4.9 and by the requirements of the various methods chosen for estimating health selection effects (tables 5.1 and 5.2). Second, I provide tables with sample statistics for all variables in the models (tables 5.3 and 5.4). In the following section I will show the association between health and job status.

Table 5.1.: Sample and Sample Restrictions for Women

	(1) Full Sample	(2) Aged <18 or >64	(3) Not or Unemployed	(4) Still in Training	(5) Self-Employed	(6) Civil Servants
1999	7,279	5,998	3,407	3,375	3,143	2,988
2000	12,762	10,296	5,843	5,794	5,390	5,115
2001	11,629	9,317	5,386	5,321	4,969	4,710
2002	12,329	9,922	5,957	5,884	5,449	4,994
2003	11,728	9,301	5,575	5,521	5,134	4,728
2004	11,452	8,988	5,422	5,361	4,962	4,579
2005	11,012	8,552	5,197	5,137	4,738	4,363
2006	11,854	9,049	5,538	5,485	5,035	4,651
2007	11,111	8,413	5,316	5,258	4,845	4,467
2008	10,436	7,831	5,099	5,043	4,649	4,298
2009	10,987	8,158	5,408	5,351	4,922	4,548
2010	10,012	7,412	4,917	4,876	4,490	4,155
2011	11,260	8,291	5,486	5,452	5,018	4,648
Total	143,851	111,528	68,551	67,858	62,744	58,244

Table 5.2.: Sample and Sample Restrictions for Men

	(1) Full Sample	(2) Aged <18 or >64	(3) Not or Unemployed	(4) Still in Training	(5) Self-Employed	(6) Civil Servants
1999	6,806	5,852	4,337	4,298	3,843	3,542
2000	11,814	9,902	7,306	7,251	6,414	5,843
2001	10,722	8,901	6,550	6,502	5,744	5,225
2002	11,563	9,539	7,047	6,994	6,080	5,403
2003	10,883	8,817	6,417	6,355	5,526	4,939
2004	10,567	8,459	6,168	6,116	5,270	4,714
2005	10,093	7,945	5,804	5,762	4,998	4,462
2006	10,811	8,327	6,092	6,047	5,204	4,646
2007	10,121	7,697	5,771	5,744	4,989	4,471
2008	9,509	7,146	5,425	5,384	4,726	4,258
2009	10,048	7,477	5,599	5,552	4,852	4,373
2010	9,115	6,717	5,053	5,016	4,396	3,952
2011	10,076	7,289	5,495	5,462	4,792	4,341
Total	132,128	104,068	77,064	76,483	66,834	60,169

Table 5.3.: Sample Statistics for Women

	Summary Statistics			
	Mean	Stand. Dev.	Min	Max
Health	-.0271	.717	-2.42	1.25
Log. Days of Sickness Absence	1.13	1.32	0	5.9
High Status Job	.123	.328	0	1
Log. Knowledge Intensity	-1.36	.679	-3.67	-.135
Male Occupation	.104	.305	0	1
Mixed Occupation	.325	.469	0	1
Female Occupation	.571	.495	0	1
Public Sector	.287	.452	0	1
Years of Education	12.2	2.4	7	18
Years of Full-Time Experience	12	10.1	0	49
Log. Wage per Hour	2.38	.512	.0077	5.63
Years of Tenure	9.24	8.87	0	47
Contractual Hours of Work	29.4	11.5	1	80
Hours of Overtime	1.53	2.8	0	23.1
Firmsize: <5	.119	.324	0	1
Firmsize: 5-19	.201	.401	0	1
Firmsize: 20-199	.293	.455	0	1
Firmsize: 200-2,000	.206	.405	0	1
Firmsize: >2,000	.18	.384	0	1
NACE 1.1: Agriculture and Fishing	.0081	.0897	0	1
NACE 1.1: Mining and Manufacturing	.162	.368	0	1
NACE 1.1: Energy and Water Supply	.006	.0774	0	1
NACE 1.1: Construction	.0163	.127	0	1
NACE 1.1: Wholesale, Hotel and Restaurant	.208	.406	0	1
NACE 1.1: Transportation and Information	.0336	.18	0	1
NACE 1.1: Financial Intermediate	.048	.214	0	1
NACE 1.1: Real Estate, Law counseling	.0915	.288	0	1
NACE 1.1: Public Administration	.359	.48	0	1
NACE 1.1: Public and Private Services	.0675	.251	0	1
Degree of Psychological Strain	5.05	3.1	1	10
Degree of Physical Strain	4.96	2.53	1	10
Household Size	2.83	1.18	1	14
Number of Children in HH	.495	.801	0	7
Married	.617	.486	0	1
Single	.216	.411	0	1
Other	.167	.373	0	1
Hours of Housework and Childcare	3.7	3.79	0	20
Age of youngest HH Member	26.1	17.3	0	64
Great Worries About Job Security	.15	.357	0	1
Great Worries About own Economic Situation	.223	.416	0	1
Satisfaction with Work	7	2.03	0	10
Age	41.8	10.7	18	64
Age^2	1861	887	324	4096
East Germany	.241	.428	0	1

Table 5.4.: Sample Statistics for Men

	Summary Statistics			
	Mean	Stand. Dev.	Min	Max
Health	.0143	.6989	-2.419	1.249
Log. Days of Sickness Absence	1.108	1.299	0	5.9
High Status Job	.2836	.4508	0	1
Log. Knowledge Intensity	-1.109	.5799	-3.665	-.1349
Male Occupation	.677	.4676	0	1
Mixed Occupation	.2449	.43	0	1
Female Occupation	.0781	.2684	0	1
Public Sector	.159	.3657	0	1
Years of Education	12.35	2.635	7	18
Years of Full-Time Experience	18.85	11.32	0	49
Log. Wage per Hour	2.642	.5163	.0077	6.405
Years of Tenure	11.05	9.983	0	50.1
Contractual Hours of Work	38.88	7.61	.6	80
Hours of Overtime	2.819	4.143	0	23.1
Firmsize: <5	.0521	.2222	0	1
Firmsize: 5-19	.1557	.3625	0	1
Firmsize: 20-199	.3084	.4618	0	1
Firmsize: 200-2,000	.2411	.4278	0	1
Firmsize: >2,000	.2428	.4288	0	1
NACE 1.1: Agriculture and Fishing	.0161	.126	0	1
NACE 1.1: Mining and Manufacturing	.3989	.4897	0	1
NACE 1.1: Energy and Water Supply	.0177	.1318	0	1
NACE 1.1: Construction	.1047	.3061	0	1
NACE 1.1: Wholesale, Hotel and Restaurant	.1145	.3184	0	1
NACE 1.1: Transportation and Information	.0717	.258	0	1
NACE 1.1: Financial Intermediate	.0437	.2044	0	1
NACE 1.1: Real Estate, Law Counseling	.0754	.2641	0	1
NACE 1.1: Public Administration	.1148	.3188	0	1
NACE 1.1: Public and Private Services	.0424	.2016	0	1
Degree of Psychological Strain	5.658	2.689	1	10
Degree of Physical Strain	5.919	3.075	1	10
Household Size	2.977	1.295	1	14
Number of Children in HH	.621	.9295	0	8
Married	.6499	.477	0	1
Single	.2416	.4281	0	1
Other	.1085	.311	0	1
Hours of Housework and Childcare	1.432	1.698	0	20
Age of youngest HH Member	24.02	17.16	0	64
Great Worries About Job Security	.1687	.3745	0	1
Great Worries About own Economic Situation	.2022	.4016	0	1
Satisfaction with Work	6.983	1.982	0	10
Age	41.87	10.72	18	64
Age^2	1868	906.4	324	4096
East Germany	.227	.4189	0	1

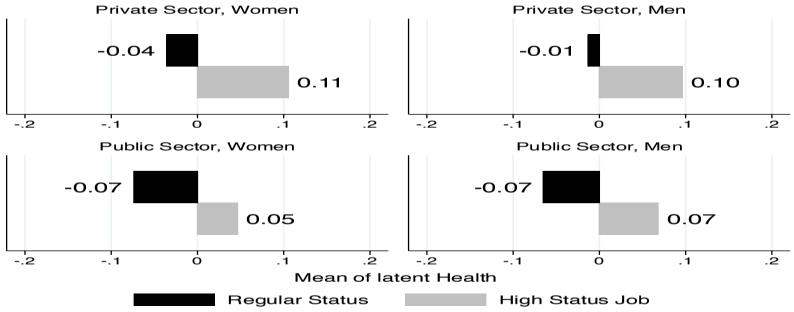
5.2. Health and Job Status - Descriptive Evidence

Figure 5.1 shows the absolute amount of health inequalities in subjective health between incumbents of high status jobs and incumbents of regular jobs. The two sub-figures a) and b) present unweighted results. Sub-figures c) and d) show results weighted with SOEP weights and sub-figures e) and f) show results weighted with SOEP weights and a weight which balances age differences between the groups. The weight for age was constructed using entropy balancing with STATAs ado package `ebalance` (Hainmueller & Xu 2011). The last row therefore presents the age adjusted health inequalities.

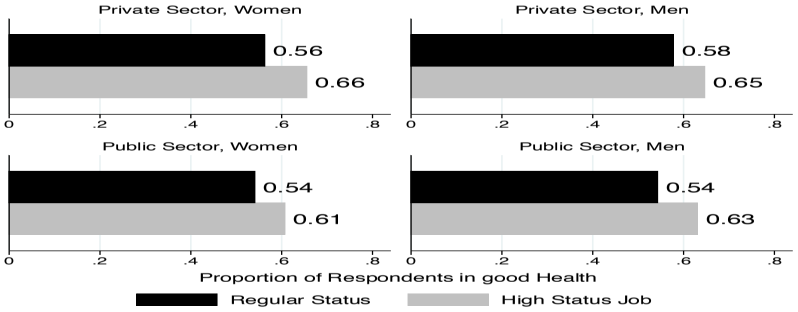
The figures show two main results. First, the health difference between regular and high status jobs is stronger for women than for men in the private sector. In the public sector no such gender differences can be observed. Second, weighting the sample with SOEP weights and equalizing age in the two groups increases the overall differences. Especially, the adjustment for age seems important. Workers in high status jobs are on average older and have a lower health status due to their higher age. Controlling for age gives us the social differences which cannot be attributed to age. For women in the private sector the adjusted differences are 0.24 on the latent health score which is about one third of a standard deviation. In high status jobs the number of individuals rating their own health as good or very good is 14 percentage higher than in regular jobs. For men these differences are 0.18 and 11 percentage points. For the public sector they are 0.17 and 12 percentage points for both men and women. All adjusted differences between status groups are significant, the difference in difference between men and women in the private sector is significant on the 10% level.

Figure 5.1.: Health Inequality due to Job Status - Subjective Health

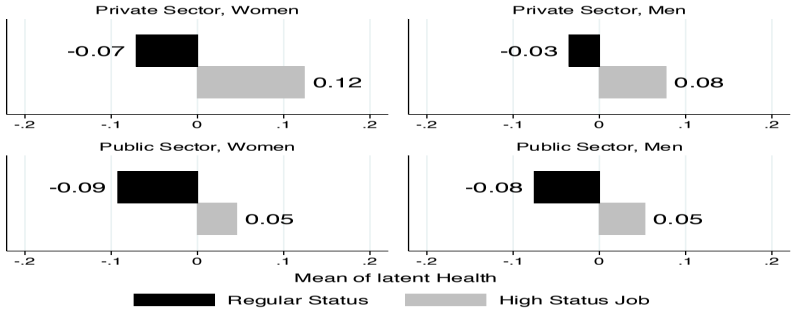
(a) Latent Health



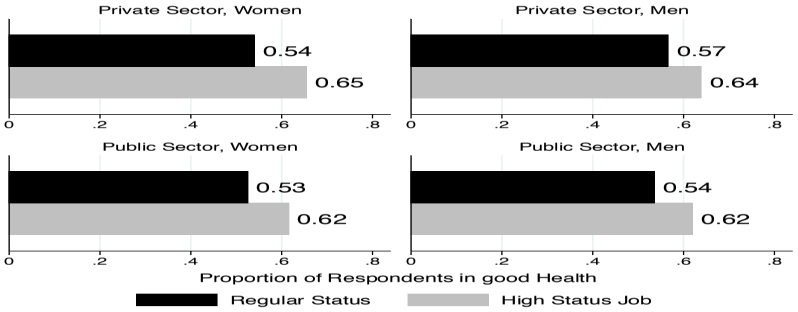
(b) (Very) good SRH



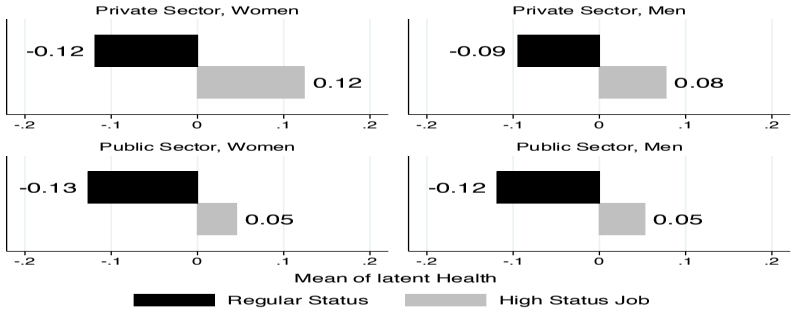
(c) Latent Health - SOEP weights



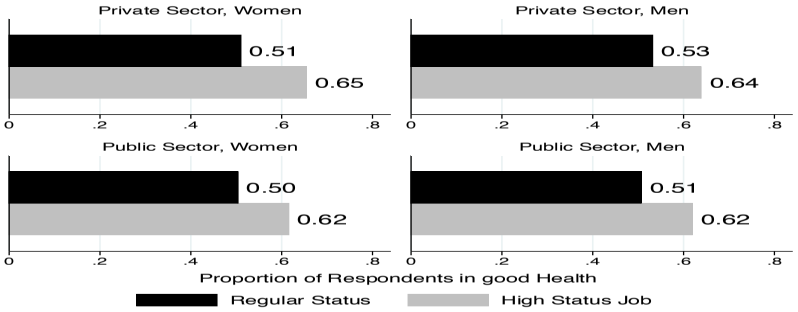
(d) (Very) good SRH - SOEP weights



(e) Latent Health - SOEP + age weights



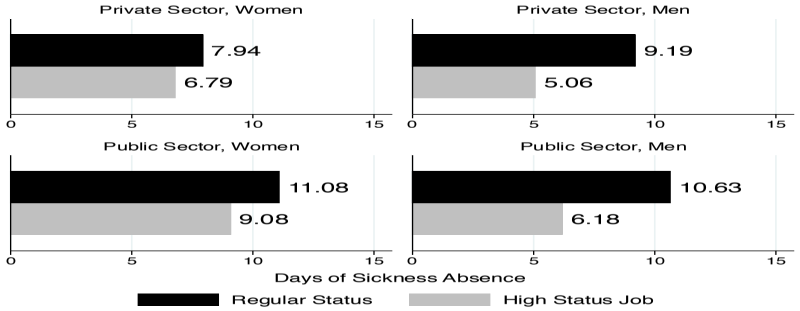
(f) (Very) good SRH - SOEP + age weights



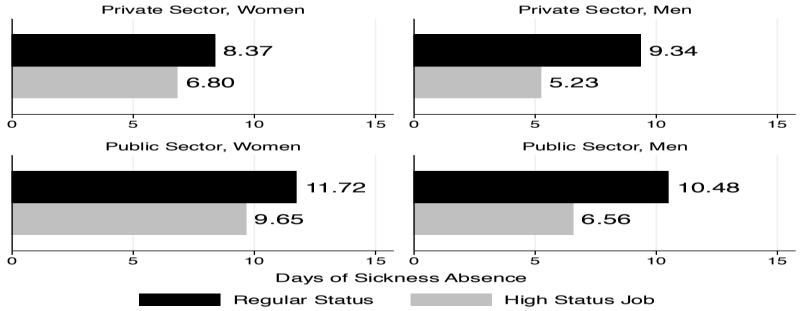
Now we can take a look at the differences in days of sickness absence (see figure 5.2). It is similar to the results from health inequalities in subjective health in the way that using SOEP and age weights increases the overall health inequalities. For women in the private sector the age adjusted health inequalities are about two days. That means women in high status jobs report on average two days less of sickness absence. For men in the private sector those in high status jobs have an average absence of 5.23 days a year whereas men in regular jobs are absent from work 9.79 days a year. This is a difference of more than 4 days, more than twice the difference of women. In the public sector the overall amount of days of sickness absence is higher than in the private sector. The relative differences between regular and high status jobs are only slightly higher. They are 2.6 days for women and 4.3 days for men.

Figure 5.2.: Health Inequality due to Job Status - Sickness Absence

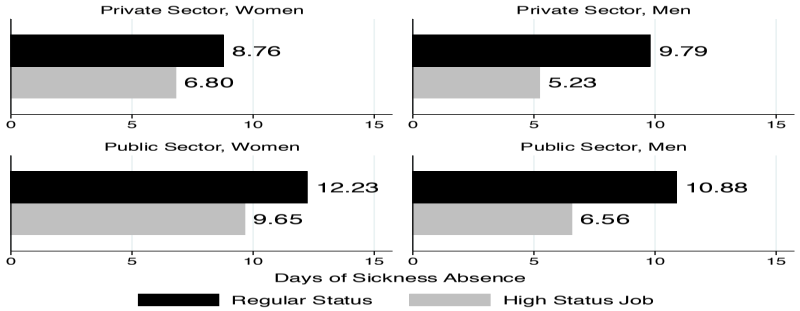
(a) Days of Sickness Absence



(b) Days of Sickness Absence - SOEP weights



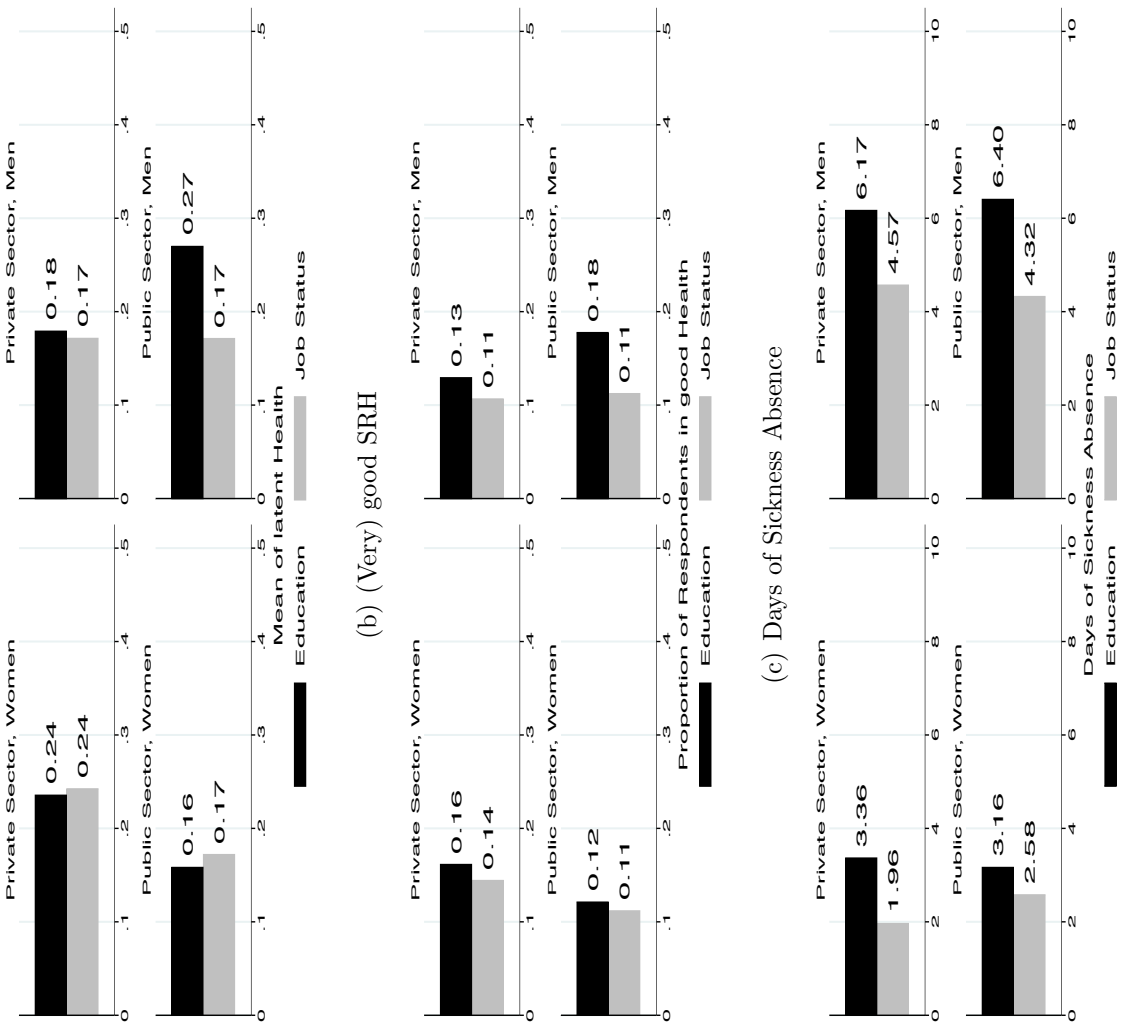
(c) Days of Sickness Absence - SOEP + age weights



I want to address one more question descriptively: Can we say there are strong health inequalities between incumbents of high and regular status jobs? The absolute values presented above tell us little about that. Health inequalities have no natural scale where the size of the inequalities can be easily assessed. The unit is not intuitive as it is with income inequalities. To solve this problem, I use an anchor to compare the degree of health inequalities. I compare health inequalities due to job status with health inequalities due to education. To be more precise I use the common CASMIN classification to build three educational groups (primary, secondary, tertiary) and compare the differences in the health variables between primary and tertiary education. This is useful, because health inequalities due to education have been found to be robust, relatively strong and can therefore serve as an anchor. Figure 5.3 shows the comparison of the magnitude of the effects in all four relevant groups. While there is some variation we can see that on average inequalities between job status are about 60-100 percent the size of inequalities between primary and tertiary education. That means that the differences in subjective health between high and low status jobs is about the same magnitude as the difference between persons with a university degree and those who only received basic schooling. So we can conclude, that while health inequalities investigated in this thesis are not exceptionally large, they are still quite sizable and of comparable importance as health inequalities between educational groups, at least with regard to their gross size.

Key results from this section are: There are sizable health inequalities between high and low status jobs, both for subjective health and for sickness absence. These inequalities are larger in the private sector. Within the private sector they are larger for women than for men.

Figure 5.3.: Size of Health Inequalities - Job Status Compared to Education



5.3. Health as a Latent Variable - Confirmatory Factor Analysis

5.3.1. Establishing Measurement Invariance

As discussed in sections 4.3 and 4.3.1 there has been serious doubt whether self-rated health is a reliable indicator for the analysis of health inequalities. To address this problem four questions will be answered in this part.

1. Are answers on items of subjective health in the SOEP comparable across gender in the population?
2. Are these items also comparable between workers in high and regular job status and between private and public sector workers?
3. Are these items comparable across time?
4. Is a latent health variable created by a factor score a good predictor of mortality?

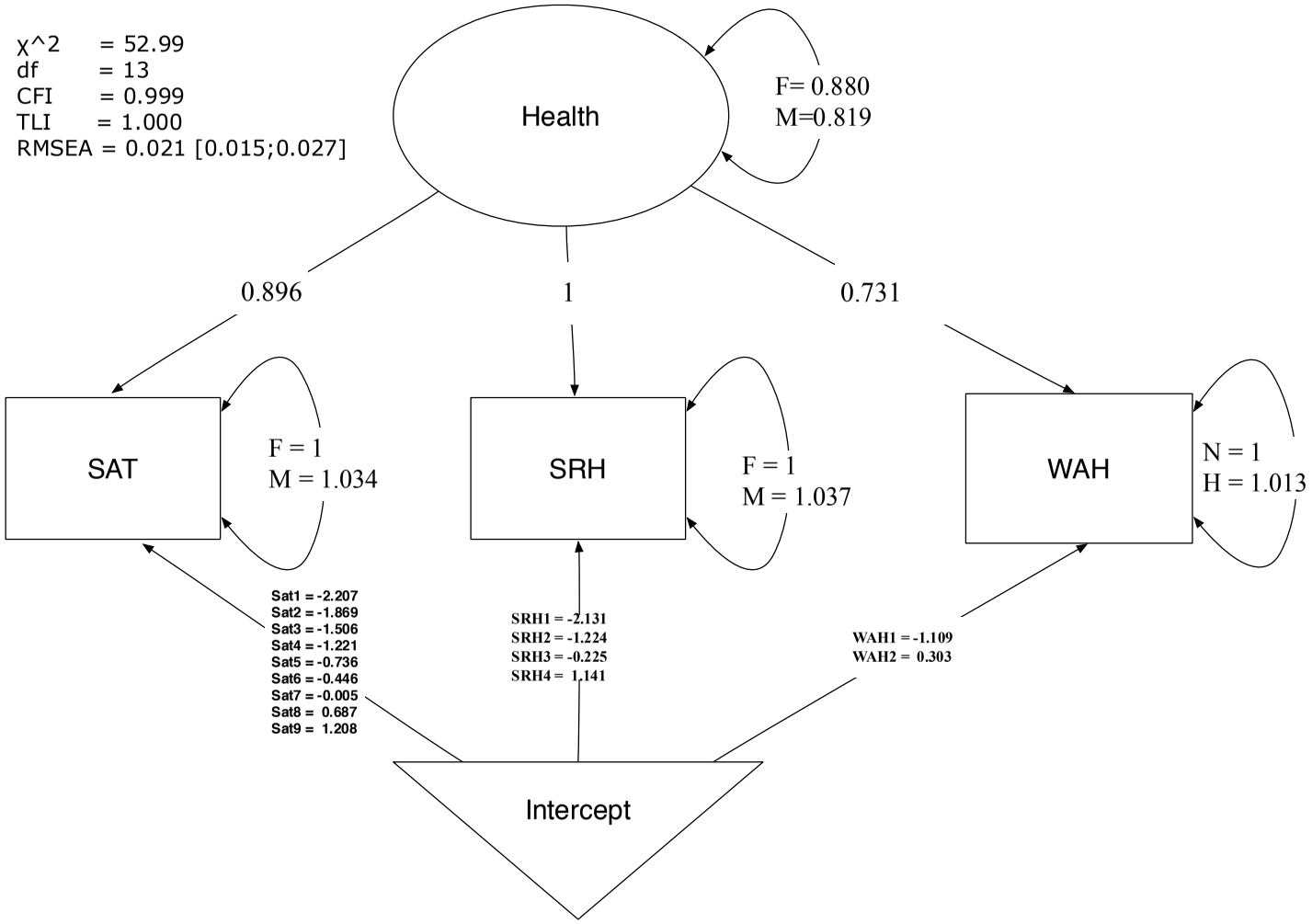
Figure 5.4 reports the results from a confirmatory factor analysis (CFA) where the latent variable health is determining the observed variables self-rated health (SRH), satisfaction with health (SAT) and worries about health (WAH) for the year 2000 in the SOEP. All observed variables are ordinal in their nature. The measurement model and the results are reported with unstandardized coefficients in figure 5.4.

I restricted the model, so that intercepts of indicators are equal across groups. This means that I test for structural invariance between genders. I do not test separately for metric invariance as this is highly complicated when dealing with categorical dependent variables. As structural invariance implies metric invariance, establishing structural invariance is sufficient. The $\chi 2$ statistic with 13 degrees of freedom is 53 and highly significant, indicating a bad model fit. However, as already explained in the methods sections this statistic is very sensitive to the number of observations which is very high in my sample (> 8000). Therefore the other fit indexes should also be scrutinized. CFI is 0.999, TLI 1.000 indicating that model fit is almost as good as the saturated model. RMSEA is 0.021 [CI: 0.015;0.027], and the confidence interval is well within the range of acceptable values. Overall the model fit is still very good, and structural invariance between genders can be established for my sample. This means that in addition to associations with other variables, means of the health variables can be compared between men and women. This will be done in the next section where descriptive evidence on health inequalities between job status is provided. Further restrictions on the model to test for equivalence of error-term variance are possible, but unnecessary for any of my further analyses. Therefore, I will not conduct them.

The first question of this section can be answered now. The items SRH, SAT, and WAH in the SOEP can be compared across gender in my sample. Any further analyses rely in

their conclusions on these tests. The confirmatory factor analysis addresses the critique that differences in effect sizes might be due to different meanings that these items carry for men and women. Regardless of whether this argument is theoretically sound, it has no empirical relevance for my data set.

Figure 5.4.: Confirmatory Factor Analysis - Gender



Note: F = Women; M = Men

Now we can turn to the question whether the health items can be compared over the years under observation. In my study these are the years 1999-2011. As this seems to be of lesser importance in the literature I will just briefly summarize the results of figure 5.5, which presents the unstandardized results and fit statistics of the models. Structural invariance can also be accepted in my sample despite the significant χ^2 statistic of 824 with 156 degrees of freedom. The high χ^2 is mainly due to the sample size of over 100,000 observations. The fit indexes are still very good, only slightly worse than the fit of the structural invariance model for gender. The CFI is 0.999, TLI 1.000, RMSEA 0.019 [CI: 0.018;0.021].
It is therefore save to conclude, that all health indicators can be compared over time for my sample.

The last measurement invariance test I am going to conduct is between workers in different job status (see figure 5.6). Again I use the year 2000 as a reference. Comparability of subjective health across job status is essential to allow causal interpretation of estimated effects in my regression models. If subjective health turned out not to be invariant it could not be distinguished whether estimated coefficients came from systematic measurement error or an actual causal relationship.
Structural invariance leads to a model with a significant χ^2 statistic of 82 with 13 degrees of freedom. However, similar to invariance over time and across gender, we can see that all other model fit indicators are very good. CFI and TLI are 0.998 and 0.997 respectively. The estimate of RMSEA is 0.031 [0.025;0.038] with the confidence interval indicating that it is very unlikely that the true parameter is above the critical value of 0.05. Such excellent fit indicators let me conclude that subjective health is comparable across job status.

Key results from this section are: Self-rated health items from the SOEP are comparable across gender, time, and job status. Differences in health effects can be substantively interpreted, because reporting heterogeneity is not an important issue in the data set.

Figure 5.5.: Confirmatory Factor Analysis - Time

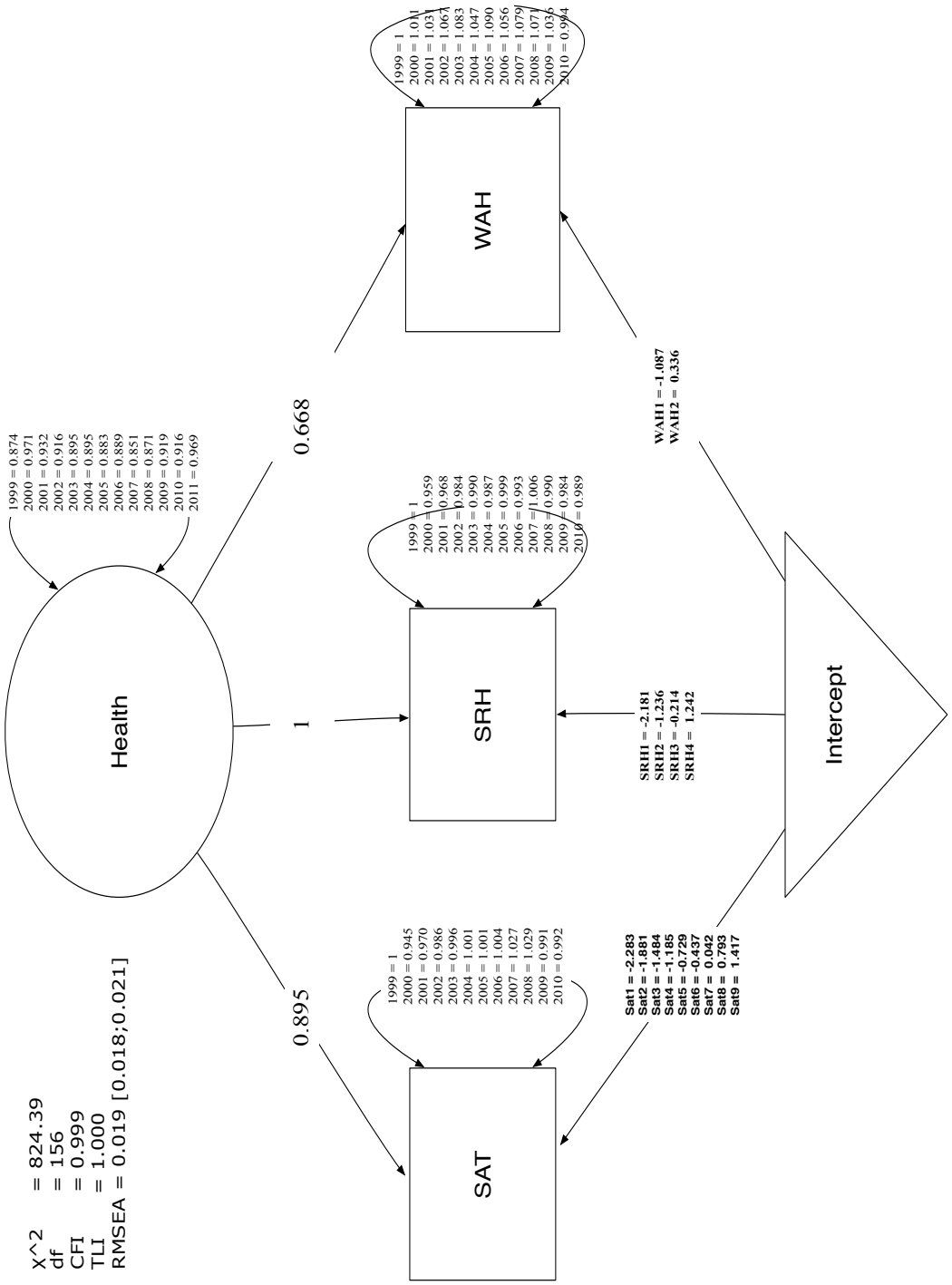
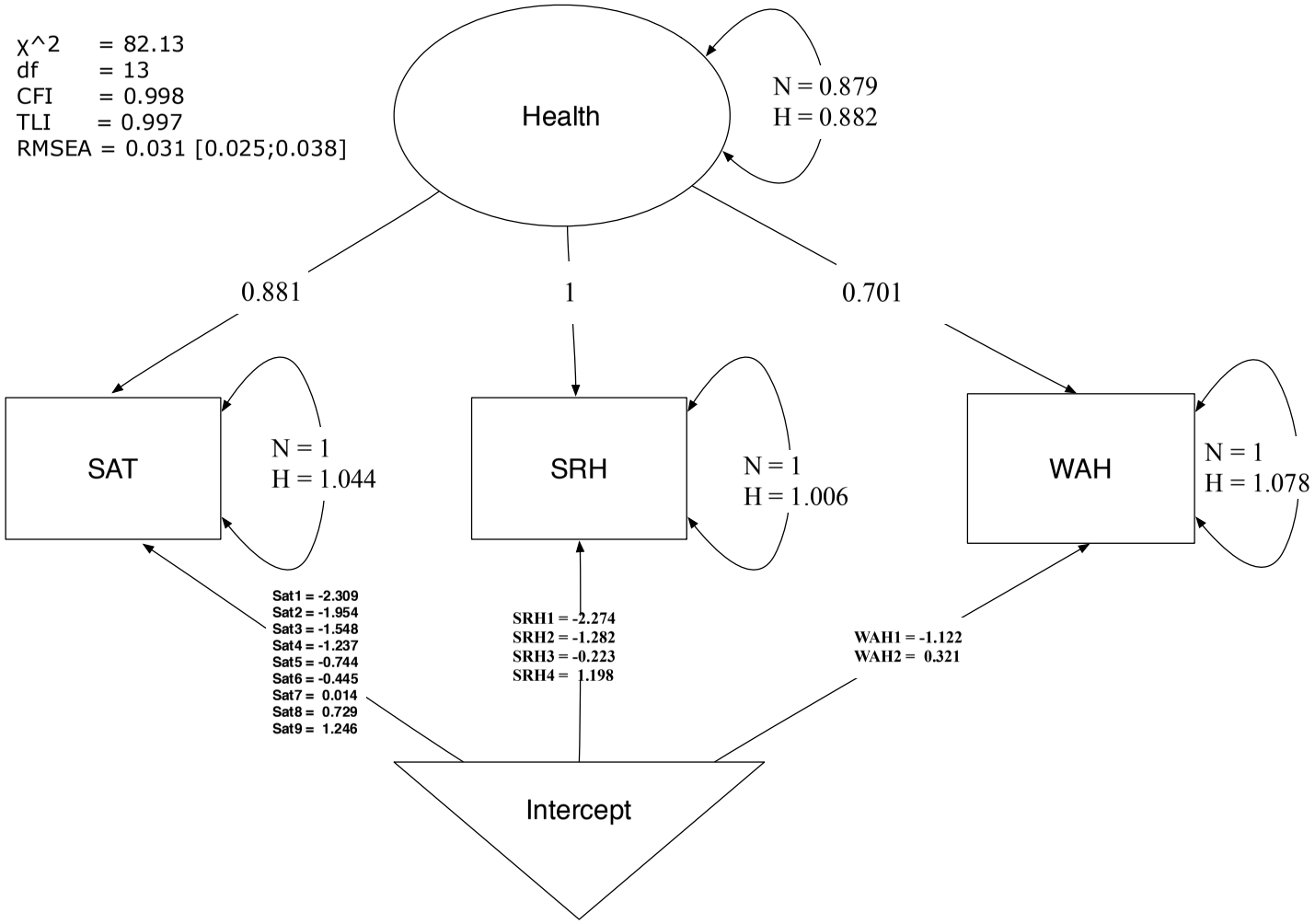


Figure 5.6.: Confirmatory Factor Analysis - Job Status



Note: N = Normal Job; H = High Status Job

5.3.2. External Reliability - Latent Health as a Predictor of Mortality

Table 5.5.: Latent Health Factor Score as Predictor of Mortality

	(1) Men	(2) Women
Latent Health	0.405	0.479
	(-19.88)	(-13.61)
R2 all Variables	0.471	0.423
R2 latent Health	0.372	0.280
Subjects	13135.000	13020.000
Deaths	914.000	723.000

Exponentiated coefficients; t statistics in parentheses

The previous section showed that my measure of health as a latent variable is internally reliable. It yields consistent scores for all relevant groups. Now, I address the external reliability. Is this latent health score a useful variable? The gold standard for such an assessment is a mortality analysis. This is important, since a general health indicator, which does not predict mortality, is not very useful.

To assess whether the latent health variable estimated from the confirmatory factor analysis model, as defined above, is a good predictor of mortality, I ran Cox proportional hazard models with latent health as an independent variable and years of education, number of doctor visits, nights spend in the hospital, occupational class according to the EGP-classification as control variables. Mortality estimates are obtained for all individuals above the age of 30, reported in hazard-ratios. The results show that latent health is a highly significant predictor even after controlling for some standard-demographic variables and some more objective measures of health. This holds for both men and women. Using Royston's (2006) method for estimating a statistic similar to the R^2 in linear regression, I come up with a contribution of latent health to the explanation of the variation in the hazard of mortality of 0.37. All other controls merely explain an additional 0.1. These are the estimates for men. For women the contribution of latent health is a little less, 0.28. Other variables explain 0.14 of the variation in the mortality hazard. Still it is clear that the factor score is a very important predictor of mortality, the gold standard of external reliability. The factor score of latent health is internally reliable as shown in the confirmatory factor analysis, and the score is also externally reliable as shown in the mortality analysis.

Key results from this section are: The constructed subjective health variable shows good external reliability through strong prediction of mortality in the data set.

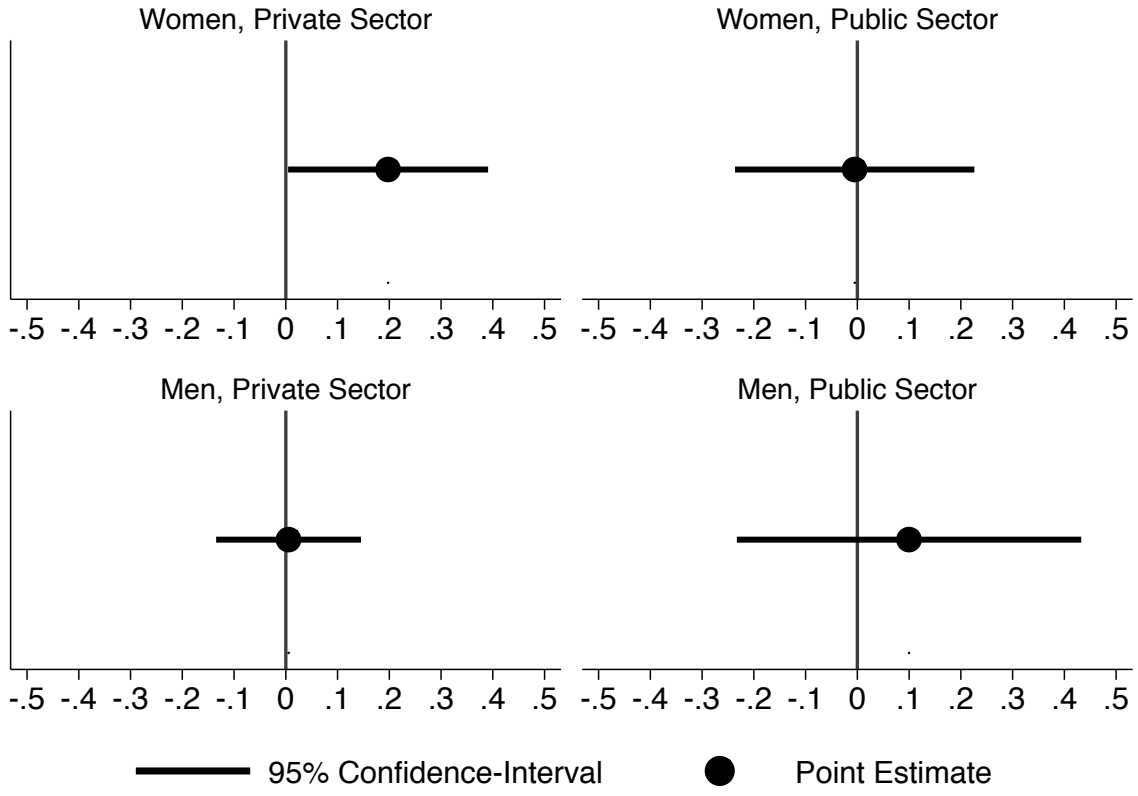
5.4. Basic Analyses

In this part, I will conduct a first test of the hypotheses made in the theory chapter. At this stage it will be only considered whether there is an influence of health on high status job (Hypothesis **H1**) and if this effect of health is stronger for men than for women (Hypothesis **H2a**). Hypothesis **H5** is also scrutinized, comparing the effects of health in private and public sector. The analyses are also repeated to address the question whether a health measure visible to the employer, like days of sickness absence, shows a different pattern (Hypothesis **H8**). For this purpose a fixed-effects-logit approach is chosen (see section 4.5). The effect of *change in health* at time point t on *change in job status* at time point t+1 is estimated. All models control for the variables described in section 4.9.2 and for unobserved time constant factors thanks to the fixed-effects method.
What is estimated is therefore only a direct effect of health on job status which is not mediated by other labor-market, or non-labor-market factors or by unobserved personal characteristics like skill or motivation. In this restrictiveness this constitutes are very strong test of the hypothesis that subjective health influences job status. However, only the uni-directional case is considered. Effects subsumed under the social causation hypothesis are discussed in a later section.
The analyses are split up between public and private sector and between men and women yielding four basic configurations. Figure 5.7 gives an overview of the effects of health on job status. The dots indicate the point estimate measured as log-odds. The lines indicate the 95% confidence intervals. If a confidence interval line crosses the line at zero, the effect is not statistically significant on the 5% level. If the line is not crossed the effect is statistically significant.

We can see that a change in health increases the chance of a positive change in job status for women in the private sector. This was to be expected from hypothesis **H1**. Surprisingly, health does not play a role for men in the private sector. It was expected that the effect should be stronger for women, but not that there is no effect for men (**H2a**).
In the public sector, we find no effects of health on job status. This confirms the hypothesis, which states that in the public sectors due to different rules for promotion, health does not play a role for high status attainment (**H5**). Promotion due to age or tenure are not related to effort and therefore not health-related. So the promotion regime seems important in determining whether health selection takes place or not. In case employers do not select on effort-relevant criteria there will be no health inequalities generated by health selection.

Now we can take a look at how the results work if we use a visible indicator as a selective factor. Do more days of sickness absence reduce the chance of getting into a high status job? And are the gender differences in the health effect the same as they were with subjective health?
Figure 5.8 shows the effect of log. days of sickness absence on job status. We can see that

Figure 5.7.: Change in Health as a Predictor of Change in Job Status



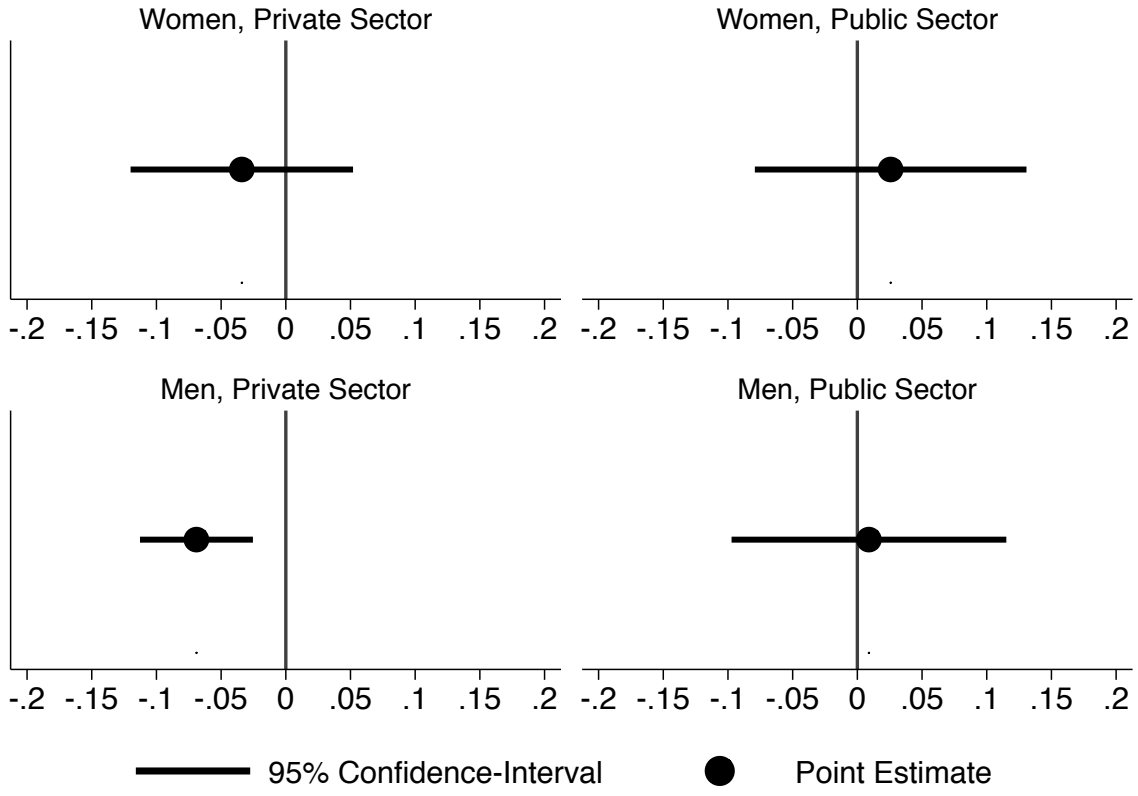
Note: The complete results of the regression can be found in table A.1 in the appendix.

from a gender perspective the results are the opposite of the results from the regressions with subjective health as an independent variable. In the public sector sickness absence does not predict a change in job status. However, in the private sector men who show an increase in days of sickness absence have a reduced chance of changing from regular jobs into high status jobs. For women we do not find a statistically significant association. Note however, that the direction of the effect for women is the same as for men. This stands in contrast to the effect of general health for men that was basically zero, and not the same direction as the female effect.

The hypothesis that sickness absence has more severe consequences for men than for women with regard to job status can be confirmed for the private sector. This supports the idea that a culture of presenteeism penalizes absence from work for men (**H8**).

Key results from this section are: Women's health is a predictor of subsequent job status in the private sector. For men in the private sector and for both men and women in the public sector the effects are close to zero. Sickness absence predicts job status for men in the private sector, and only to a smaller (non significant) degree for women. In the public sector sickness absence does not matter for job status.

Figure 5.8.: Change in Sickness Absence as a Predictor of Change in Job Status



Note: The complete results of the regression can be found in table A.2 in the appendix.

5.4.1. Other Model Specifications

Figure 5.9 shows the same analyses as figure 5.7, but with some different specifications of the model. We can see that the effect of health for women in the private sector - the only substantial effect in the full model specification -is gradually reduced when taking additional sets of variables as controls into the regression. However, the overall trend is not very strong. In all other settings differences between models are existent, but the differences are not huge. In no case does one model specification produce a completely different result. All in all the results seem to be very stable and robust to the sets of control variables.
The same is true for different specifications of the models with sickness absence. They are presented in figure 5.10 and are rather robust. Controlling for an anticipation effect has the strongest impact on the estimate coefficient of sickness absence.

Key results from this section are: Effect estimation is not sensitive to the introduction of control variables.

Figure 5.9.: Different Model Specifications of Results - Health

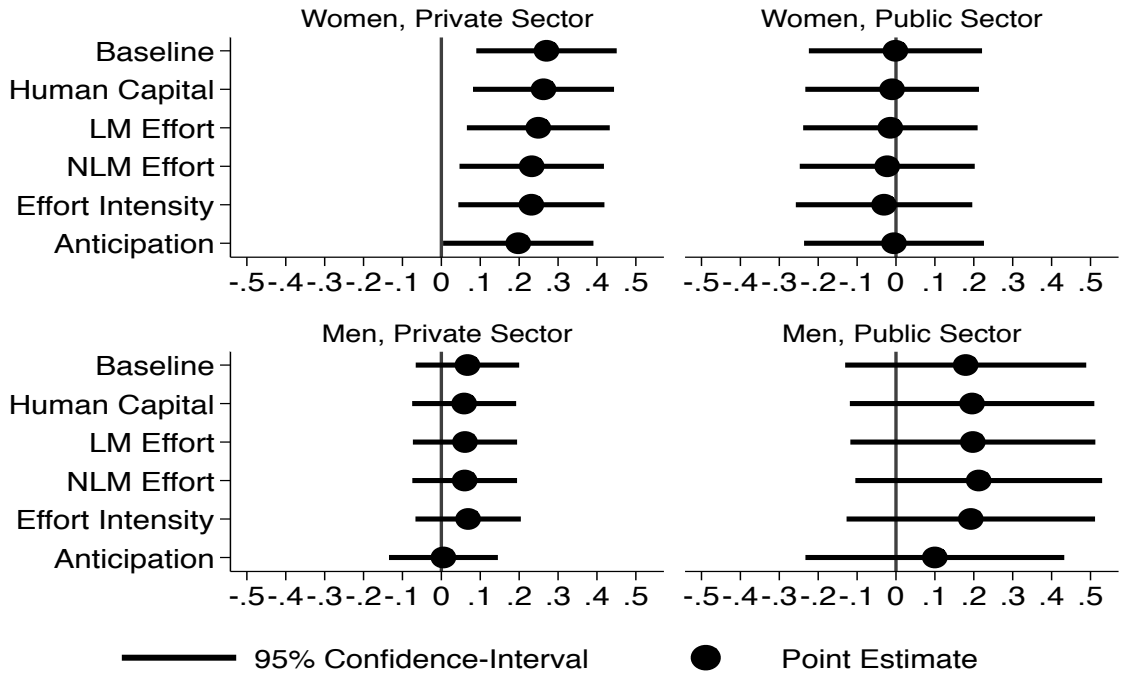
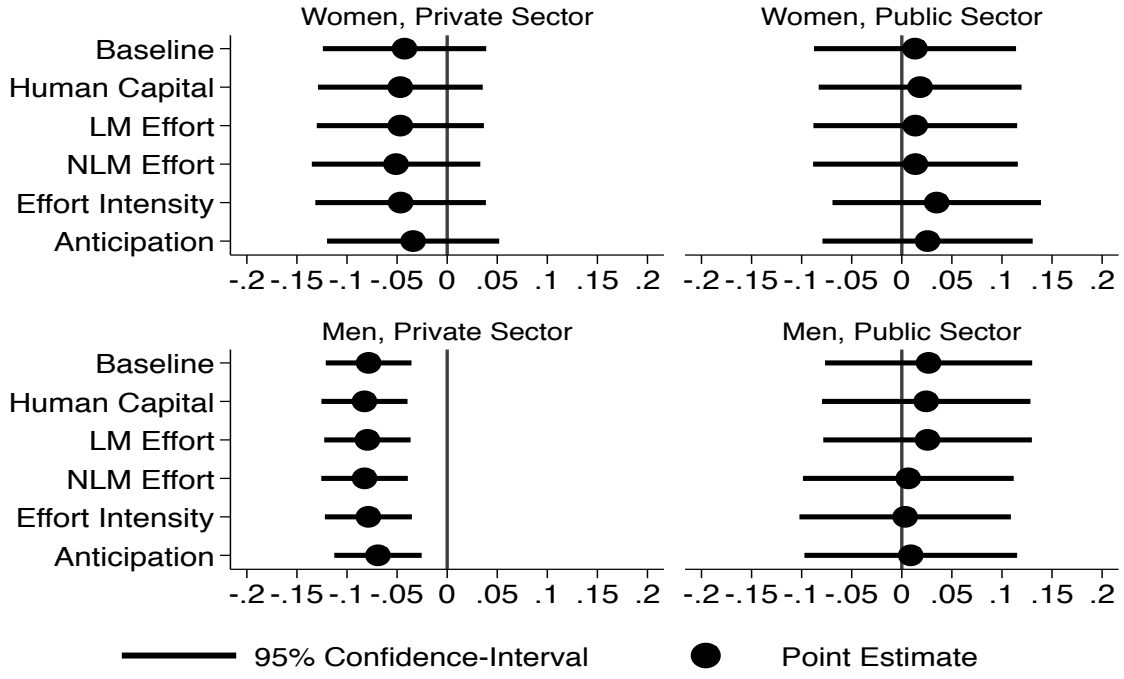


Figure 5.10.: Different Model Specifications of Results - Sickness Absence

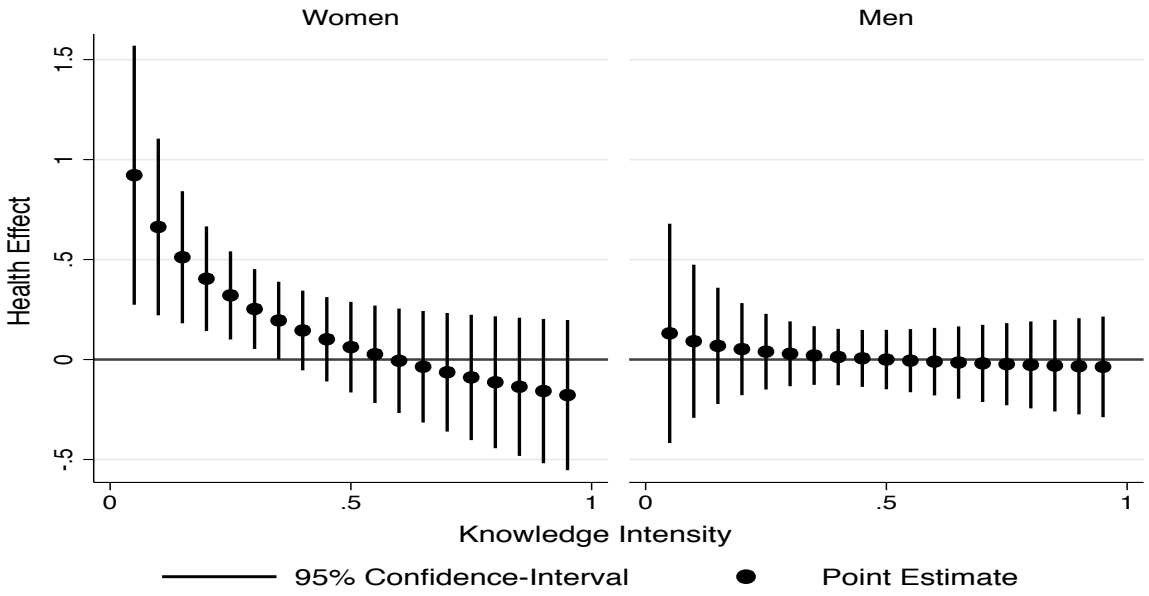


5.4.2. Taking a Closer Look at Closure in the Private Sector: Glass Escalator and Professionalism

So far we have seen that health selection does not operate *within the public sector* with regard to job status. This was expected from the theory (**H5**). Now, I will take a closer look at differences within the private sector. The estimates from the last section are averaged estimates for the private sector. We can make differentiations of occupations according to different kinds of social closure. In particular, I will look at the share of women in an occupation and at the degree of knowledge intensity of an occupation. The first measure allows me to test the "glass-escalator" hypothesis (**H7c**) versus the homophily-hypothesis (**H7b**). The second measure allows to assess in how far credentials or professionalism modify health selection processes (**H7a**).
As described in more detail in section 4.10, I distinguish between female-dominated, male-dominated, and mixed occupations. I take the natural logarithm of knowledge intensity as an interaction term with health into the regression.

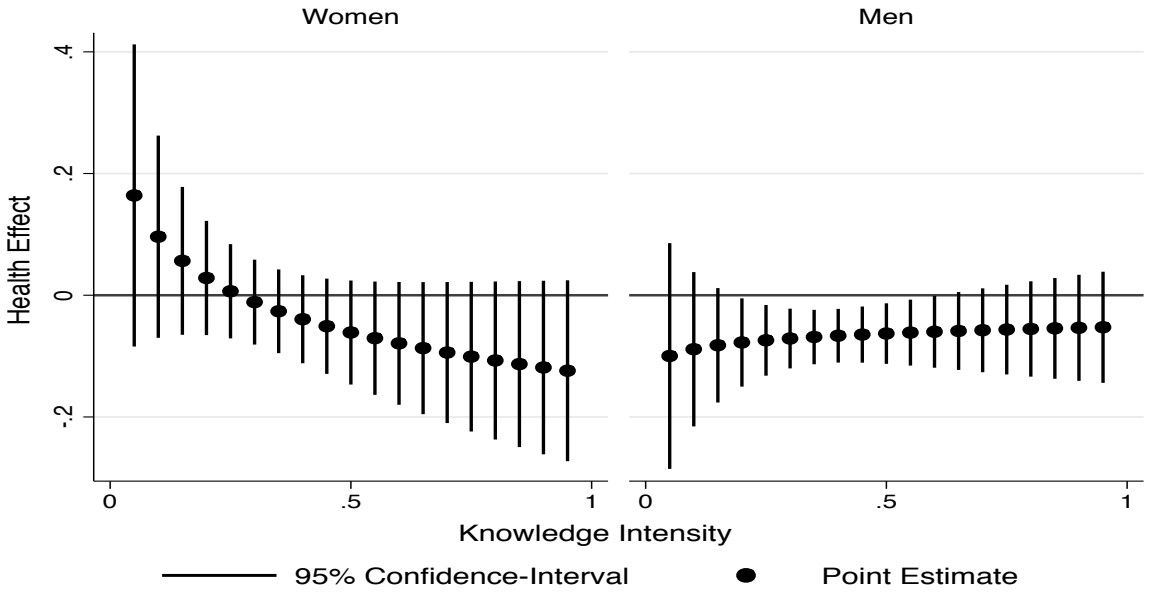
The results are shown in figure 5.11. We can see that there is a significant logarithmic relationship between knowledge intensity and the health effect on job status. For women who work in occupations with low knowledge intensity the health effects are stronger and statistically significant. While professionalism and specialization get stronger health becomes less important for job status among women. For men the association of the effect size and knowledge intensity is weak, not significant and at no point is health a substantial predictor of job status.
There seems to be no clear interaction pattern for sickness absence with knowledge intensity. Figure 5.12 shows the effect of log. days of sickness absence on job status depending on knowledge intensity. For men the peculiar finding is that there is no overall trend of the health effect with rising knowledge intensity, but in between the effects become significant. This is due to the fact that the number of observations is higher in the middle range of knowledge intensity than for the very high or very low values. For women the trend is inversed and insignificant.
It seems that a high degree of knowledge intensity does protect workers from competition, at least competition related to effort and health (**H7a**). However, for men this type of closure does not make any difference in their health effect. This supports the hypothesis that men do not adjust their effort to their health status. Else we would expect to see some differences in the effects between different types of occupational closure.

Figure 5.11.: Health Effect Depending on Knowledge Intensity of Occupation



Note: The complete results of the regression can be found in table A.3 in the appendix.

Figure 5.12.: Effect of log. Days of Sickness Absence Depending on Knowledge Intensity of Occupation



Note: The complete results of the regression can be found in table A.4 in the appendix.

In figure 5.13 we have an assessment of the "glass-escalator" hypothesis for the question at hand. Is health selection stronger for women in female or in male dominated occupations? And is this effect symmetric - so are the results for men the opposite?
The results for women show that only in female dominated occupations there is a strong and

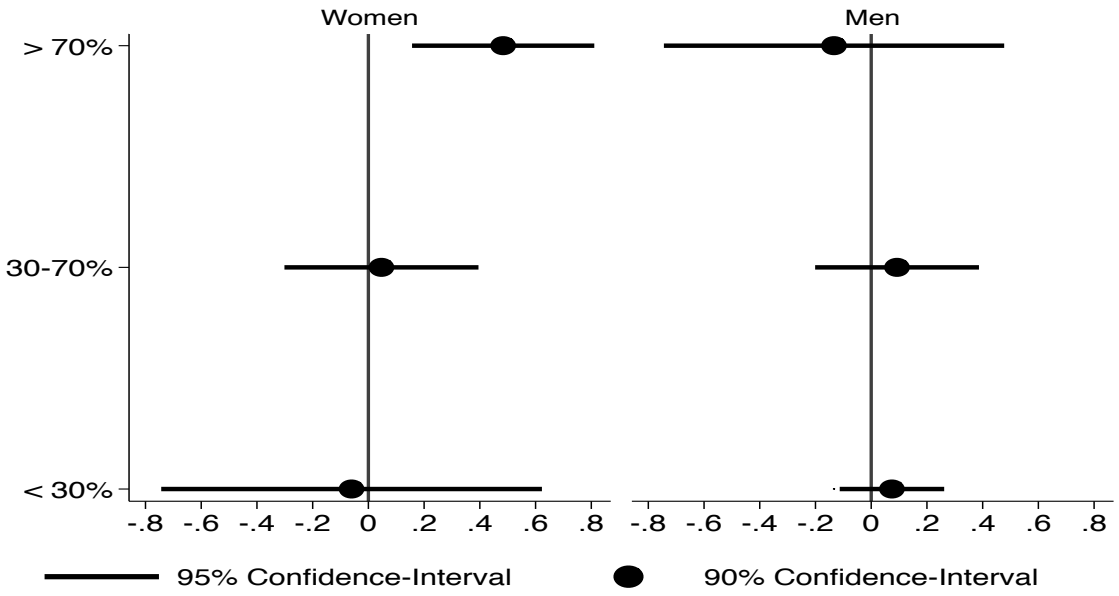
significant effect of health on job status. For mixed occupations the effect is almost zero. For male dominated occupations the effect is close to zero and not significant. This supports the "glass-escalator" hypothesis (**H7c**) and not the homiphily hypothesis (**H7b**).
For men again we find that there is no substantial health effect in any of the three types of occupations. Regardless of token or majority status, health does not seem to play a role for a change in job status for men.
When looking at days of sickness absence we see that it is mostly women and men in male dominated occupations who are influenced in their job status (see figure 5.14). The point estimate for women is much stronger than for men. The standard error is also very large due to the fact that there are very few women in the sample working in a male dominated occupation[1]. The strong effect for women points to a token position in these occupations. The culture of presenteeism puts pressure on men, but even more pressure on women. This lends strong support to the idea that male work culture demands presenteeism and punishes absenteeism (**H8**). Interesting is that in female dominated occupations for both genders we get estimates of similar size to the effect of sickness absence for men in male dominated occupations. In female dominated jobs it seems that there is a slight selection effect regardless of gender. Due to sampling uncertainty the conclusion is not as strong as for male dominated occupations.

Overall it is interesting that women face health selection in female dominated occupations, but not in other kinds of occupation. This is an important finding for two reasons. First, it shows that the context of occupation mediates health effects. Social context does play a role in determining whether health selection produces health inequalities or not. Second, women are most often employed in female-dominated occupations. This is almost a truism, but relevant. Most women - but not all - work in an environment where job status is linked to their health. And most jobs in those occupations are traditionally not well paid and offer little possibilities for advancement anyway. Health selection in this case applies to those already worse off on the labor market, not the better offs[2].

Key results from this section are: Subjective health is a selective factor only for women in female dominated jobs supporting the "glass-escalator" hypothesis. Sickness absence negatively affects job status in male dominated occupations, possibly stronger for women.
The higher the knowledge intensity is, the lower the subjective health effect for women. The trend is opposite for sickness absence. For men there is no interaction of sickness absence and knowledge intensity.

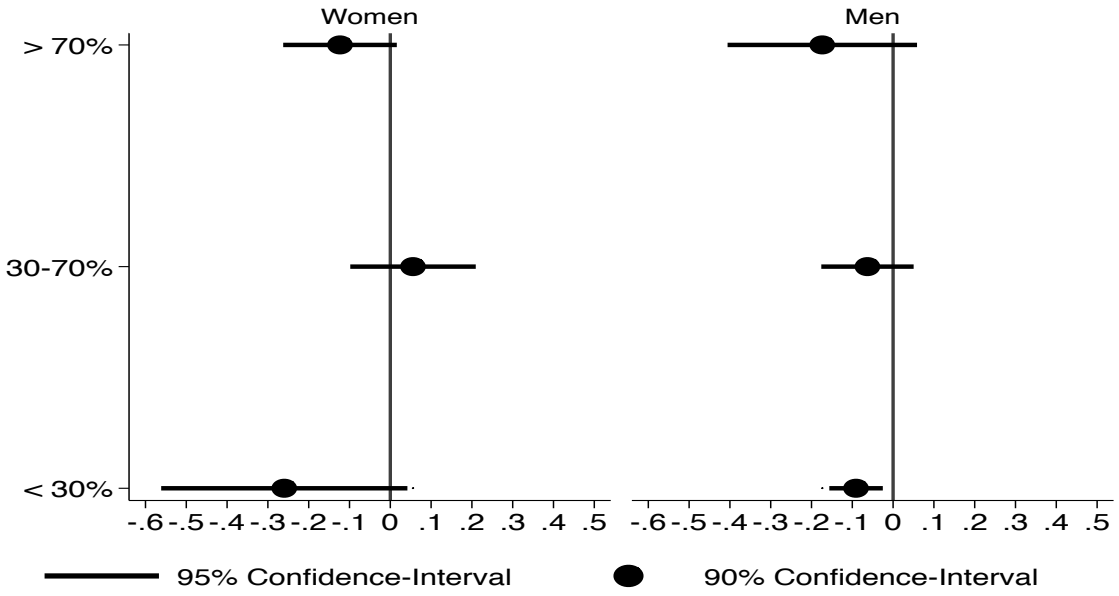
[1] If the analyses are repeated using a fixed-effects-LPM point estimates are also significant.
[2] In other settings this might be different.

Figure 5.13.: Health Effect Depending on Male or Female Dominated Occupations



Note: The complete results of the regression can be found in tables A.5 and A.6 in the appendix.

Figure 5.14.: Effect of log. Days of Sickness Absence Depending on Male or Female Dominated Occupations



Note: The complete results of the regression can be found in tables A.7 and A.8 in the appendix.

5.5. Effects of Long Term Health Conditions

The previous analyses looked at the effect of contemporary changes in health. In this part, I will take a look at long standing health conditions to test whether a long standing health condition has a stronger impact on job status than a short-term health condition (Hypothesis **H2b**). For this purpose I construct a categorical variable indicating how long a person has reported less good or poor health. I count how many years in a row each individual reports poor health. Then I categorize the variable into four categories:

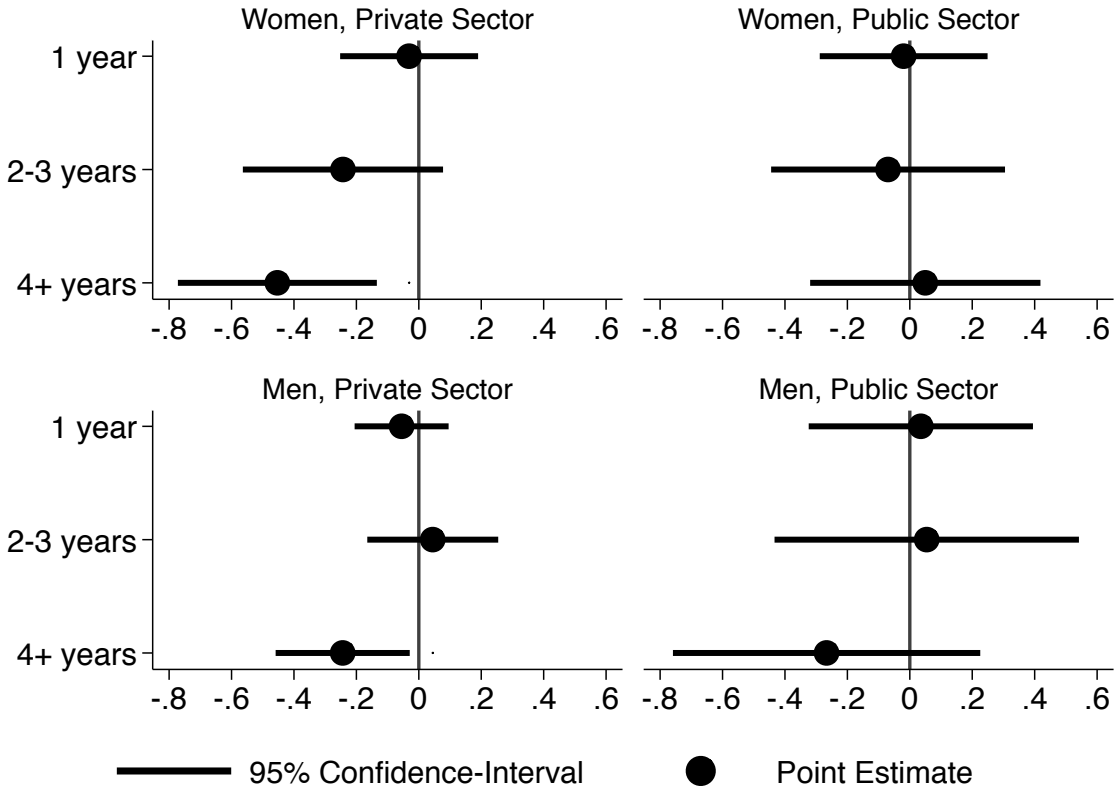
1. not in poor health
2. 1 up to 2 years in poor health
3. 2 up to 4 years in poor health
4. 4 years and more in poor health

The reference category for the analysis are those individuals who do not report poor health. The method is fixed-effects-logit regression, as before. All models control for the same set of variables as all previous models. In figure 5.15 we see the results of long-term health conditions on job status. For women in the private sector we see that the longer the health condition lasts the stronger the effect on job status is. For 1 year in poor health the effect is almost zero. For 2-4 years it is about 0.25, but not significant. Long term spells of 4 years and more have a severe effect on the chance of getting into a high status job. The effect is about 0.45 which is equal to an odds-ratio of 1.56.
For men in the private sector only 4 years and more in poor health have a negative impact on job status. The point estimate is about 0.22 and significant. The other categories are not significantly different from the reference category and show no substantial effect. These results are in line with the prediction (**H2a**), that the health effect should be less for men than for women. It seems that only long lasting severe conditions influence men's chance of getting into a high status job. This would support the idea that men usually do not adjust their effort to their health status. Very longstanding health conditions seem to be the exception.
In the public sector we do not find the same effects as in the private sector. For men, long-standing poor health has a negative impact, but the effect is not significant[3]. The conclusion that long standing health conditions influence men's job status in the public sector should take the large standard error into account. In conclusion, the results suggest that hypothesis **H2b** can be seen as accepted for the private sector and has to be rejected for public sector.

Key results from this section are: The longer the period of poor health lasts the stronger the negative effect is on job status. This gradient is stronger for women than for men, but cannot be established with certainty in the public sector.

[3]probably due to smaller sample size.

Figure 5.15.: Change in Long Term Bad Health as a Predictor of Change in Job Status



Note: The complete results of the regression can be found in table A.9 in the appendix.

5.6. Health Effects and the Status of Applicants vs. Incumbents

Up to this point, I have treated change in job status as if changing from a normal job into a high status job means the same as changing from a high status job into a normal job. This implies treating a promotion and a demotion as if the same mechanisms are at work. Is it a feasible assumption that climbing up the job ladder relates in the same way to health as tumbling down the job ladder?

The theory in section 2.8.1.2 states that this would be an oversimplification of health selection mechanisms if open and closed positions are considered. High status jobs are defined as closed positions. Therefore it is expected to be hard to get into such a position, because the applicants face a *job competition* or *career tournament* situation. The positive effect of a closed position for an employee is that incumbents are protected from competition. Health should therefore be among the criteria on which employers select their employees when looking for new incumbents of a high status job. However, once occupying such a position health should no longer affect job status. The incumbents can keep their position regardless of performance and health. Thus, I use survival analysis to estimate the effects of health on the separate events, high status

attainment and loss of high status job, to test hypotheses **H4**, **H5**, and **H6**.

The results presented in this section are based on a non-parametric discrete event-history or survival analysis described in section 4.6. The models estimate the "risk" to change job status from normal to high status and vice versa. All employees in normal jobs are treated as applicants, all those in high status jobs as incumbents. The event for applicants is the change into a high status job, for incumbents the event is changing into a regular job. After the event takes place or an observation is censored, the analysis ends. As in the previous sections the results are reported in log-odds. All models control for the same set of covariates as in the previous models.
Figure 5.16 shows the results of the analysis stratified by gender and by private and public sector. Just as a reminder: In the regular analysis health showed substantial effects only for women in the private sector.
For women in the private sector only applicants are selected according to their health status as proposed by hypothesis **H4**. Incumbents of high status jobs have a similarly higher risk of dropping out of their position with increasing health (sic!), which is a very surprising result. Taking the low significance level into account only marginally reduces the concern about the finding, because the size of the effect is quite sizable. Men in the private sector do not face health selection as either incumbents or applicants, which supports hypothesis **H4**, but partially speaks against hypothesis **H1**.
For women in the public sector health does not play a role for job change neither as incumbents nor as applicants. The same holds true for men in the private sector. In the public sector there is a positive health effect on high status attainment as an applicant, and a negative effect as an incumbent, both insignificant due to small sample size. These results are supporting hypothesis **H5** for women, stating that there is no health selection in the public sector. For men the picture remains unclear.

If we look at the effect of sickness absence in figure 5.17 we can see that the results are similar to the results from health as an independent variable. In the fixed-effects-logit analysis we could only find a significant effect of sickness absence on status change for men in the private sector. Sickness absence only matters for applicants for high status jobs, not for incumbents, which supports the theory. The effect vanishes once a person already is inside a closed position. In all other constellations there are no significant effects of sickness absence on the chance of either getting or losing a high status job. For incumbents of high status jobs in the public sector, the number of events was too low to report reliable estimates. However, the low number of drop-outs indicates that losing such a job is so rare, that it probably cannot be related to days of sickness absence.

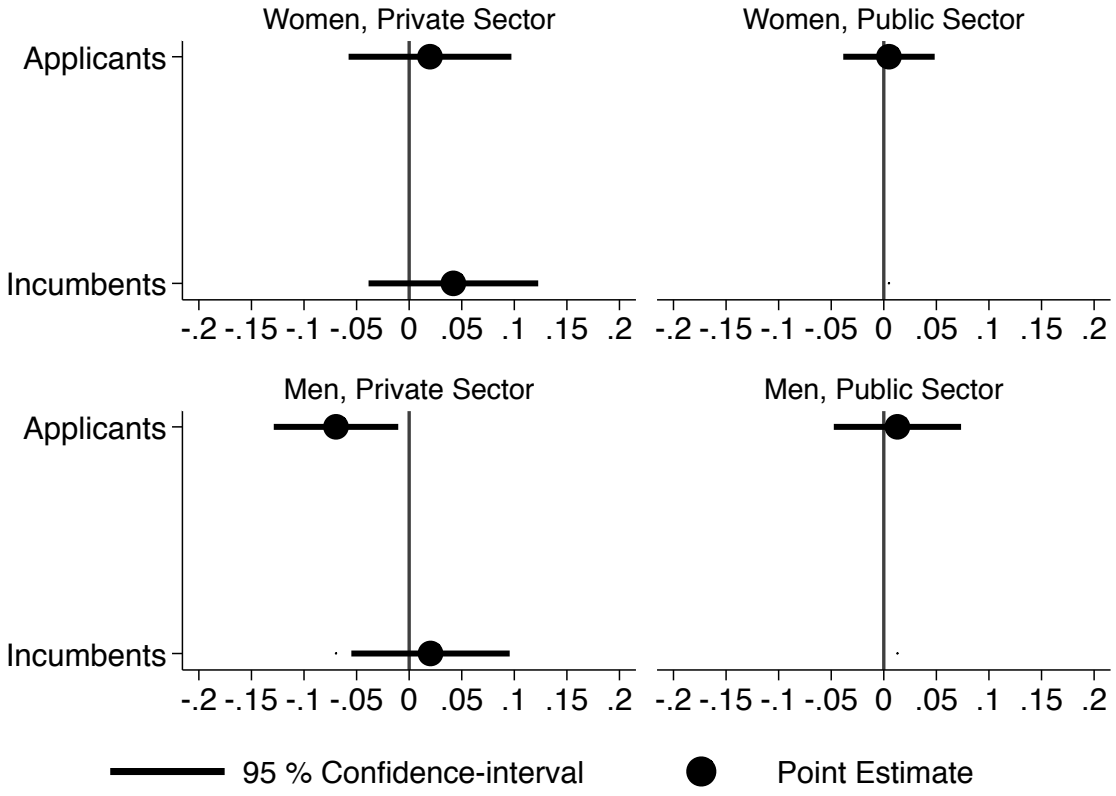
Taken together the results reveal two things. First, the differentiation between incumbent and applicant makes sense not only in theoretical terms, but reveals more detailed structures in the empirical analyses as well. This counts for both visible and non-visible measures of health. Second, the results are very similar to the analyses using a fixed-effects-logit approach. This speaks in favor of the stability and robustness of the models chosen. For women in the private sector the point estimates are almost the same in the survival analysis models as in the fixed-effects-logit models.

Key results from this section are: Subjective health has a positive impact on high status attainment for women in the private sector. The effects for women in the public sector are almost zero as are the effects for men in the private sector. For men in the public sector the results suggest strong selection effects, but sampling uncertainty is high.
Sickness absence matters for male applicants in the private sector. All other respective effects are negligible.

Figure 5.16.: Health Effect on Status Change Depending on the Position of Applicant or Incumbent

Note: The complete results of the regression can be found in tables A.10 and A.11 in the appendix.

Figure 5.17.: Effect of Sickness Absence on Status Change Depending on the Position of Applicant or Incumbent



Note: The complete results of the regression can be found in tables A.12 and A.13 in the appendix.

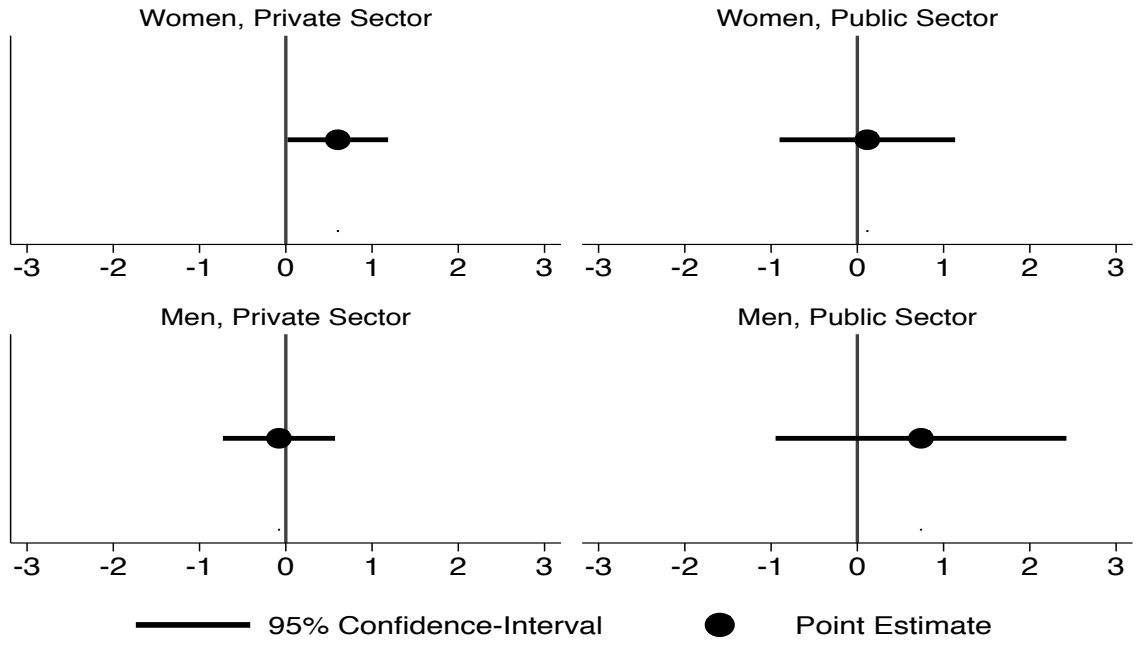
5.7. Testing Health Selection vs. Social Causation

Up until this point, I have only looked at unidirectional approaches to modeling health selection effects. Now, I will take a further step and evaluate health selection versus social causation in one model. I will do this once in a cross-sectional perspective and once from a longitudinal fixed-effects approach. This chapter therefore reexamines hypotheses **H1**, **H2a**, and **H5** with a new method, and allows the first test of hypothesis **H9d** from the social causation perspective, testing for a **direct** social status effect on health. In the next section, hypotheses **H9a** - **H9c** can also be tested using a decomposition approach that is based on the same models as in this section.

Figure 5.18 shows the effects of the cross-lagged fixed-effects regression, which is the next step from a unidirectional fixed-effects approach. The model simultaneously estimates the effects of health at time point **t** on job status at **t+1** and job status at **t** on health at **t+1**. It controls for the same variables as the models presented before and for time constant unobserved effects. The error terms of the dependent variables are allowed to be correlated.

We can see that the health effects are barely affected by allowing for reversed causality. The pattern of the results is the same as it has been with the unidirectional fixed-effects approach. Health plays a role for women in the private sector, but not in the public sector. For both men in the private and in the public sector health has no substantial impact on the probability of a change in job status. So the interpretation that health effects are only found for women in context of competition holds true for this model specification as well.

Figure 5.18.: Health Effects - Allowing for Reversed Causality in a Cross-Lagged Model with Fixed-Effects

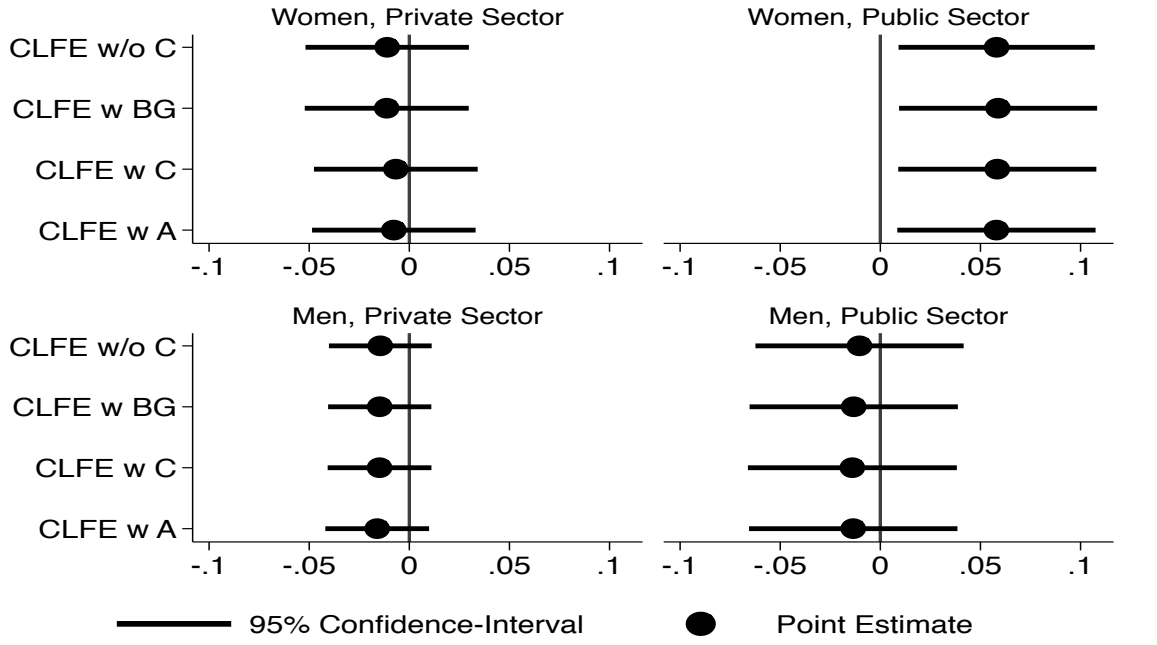


Note: The complete results of the regression can be found in tables A.14 and A.15 in the appendix.

But what about social causation effects? Finding or not finding health selection effects in the model does not tell us whether social causation effects also exist. These results of the simultaneous equation, which tests the effects of job status on health, are presented in figure 5.19. While there are health selective effects for women in the private sector no social causation effects can be found for this constellation. Direct social status effects cannot be found for men either. However, for women in the public sector high status jobs seem to increase health. This is the only social causation effect which can be found.

Note, however that it is only the *direct* effect that was estimated. What I have not considered so far is that social causation might work indirectly via observed job characteristics, which are controlled for in the model. To see whether there is such an indirect social causation effect I divide the control variables into three groups. The first group are background characteristics which are not directly influenced by a change in job status. This includes all variables concerning household characteristics, characteristics of the occupation and employer, years of education

Figure 5.19.: Effects of High Status Jobs on Health - Allowing for Reversed Causality in a Cross-Lagged Model with Fixed-Effects



Note: w/o C = without controls; w BG = with background characteristics (group 1); w C = with BG and job controls (group 2); w A = with anticipation effect (group 3). The complete results of the regression can be found in tables A.14 and A.15 in the appendix.

and years of full-time employment. The second group consists of variables measuring job characteristics which *might* change with job status. These are hours of work, overtime, and log. wage per hour. Third, the anticipation variables as social-psychological mediators are grouped together. Table 5.6 gives an overview.

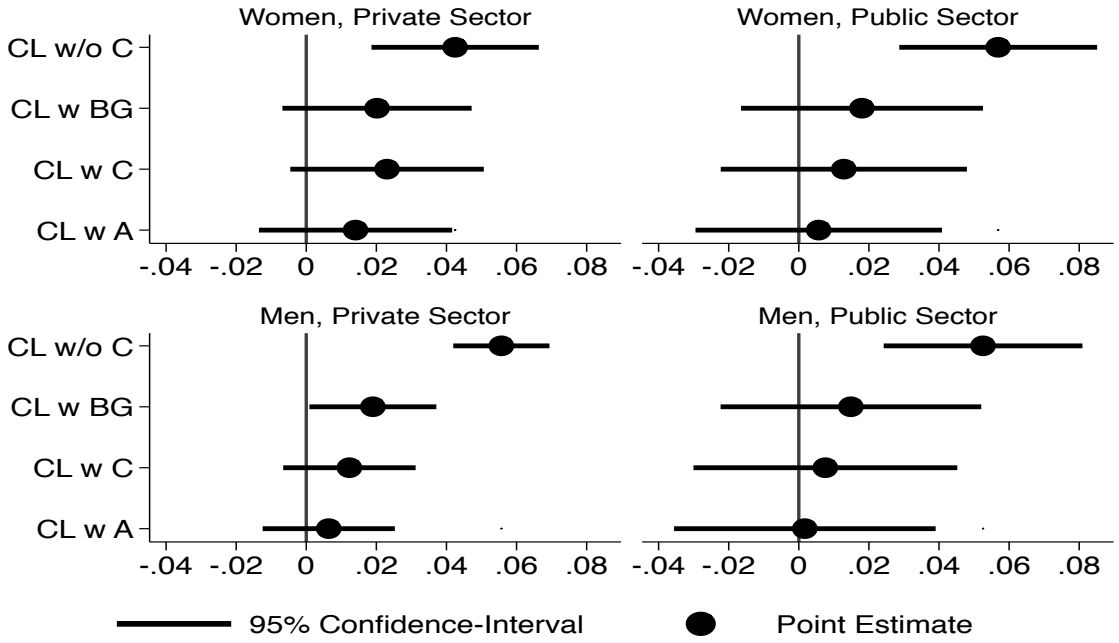
Table 5.6.: Variable Groups for Assessing Mediated Effects

Variable	Mechanism	Group
Anticipation of Job Loss		
Worries About Job Security	social causation - social-psychological	3
... own Economic Situation	social causation - social-psychological	3
Satisfaction with Work	social causation - social-psychological	3
Human Capital		
Education	third factors - background characteristics	1
Job Tenure	social causation - environmental-materialistic	2
Labor Market Experience	third factors - background characteristics	1
Wage	social causation - environmental-materialistic	2
Labor Market Effort and Effort Intensity		
Industry of Employer	third factors - background characteristics	1
Firm Size	third factors - background characteristics	1
Work Hours	social causation - environmental-materialistic	2
Overtime	social causation - environmental-materialistic	2
Effort Intensity (Physical)	third factors - background characteristics	1
Effort Intensity (Psychological)	third factors - background characteristics	1
Non-Labor Market Effort		
Number of HH Members	third factors - background characteristics	1
Number of Children	third factors - background characteristics	1
Marital Status	third factors - background characteristics	1
Housework and Childcare	third factors - background characteristics	1
Youngest HH Member	third factors - background characteristics	1
Demography and Period Effects		
Period Effects	basic control variable	-
Age	basic control variable	-
Age^2	basic control variable	-
East Germany	basic control variable	-

This division has the following advantages. If background characteristics mediate the effect, this lends credibility to the explanation that health inequalities between job status are at least partly explained by spurious correlation or third factors. If group two or three of the control variables mediate the effect, this points to a social causation explanation based on either environmental-material or social-psychological grounds. The remaining effects from above present social causation effects not explained by these factors.

Surprisingly, taking control variables into the model does not influence the estimation of the impact of job status on health. Regardless of whether we look at women or men, public or private sector, the effects remain constant. This indicates that confounders can probably only be found in a cross-sectional analysis, because any existing health inequalities which might be explained by third factors are explained by time constant factors. For this reason I ran the whole models one more time without using a fixed-effects approach. Figure 5.20 shows the results of these models. Indeed background characteristics which are rather stable over time can explain most of the effect that high job status has on health. For all contexts job status effects become insignificant and are reduced in magnitude when taking these background factors into account. Both groups of social causation variables further reduce the effect of job status but not as much as the background factors do.

Figure 5.20.: Effects of High Status Jobs on Health in Cross-Section - Allowing for Reversed Causality in a Cross-Lagged Model



Note: w/o C = without controls; w BG = with background characteristics (group 1); w C = with BG and job controls (group 2); w A = with anticipation effect (group 3). The complete results of the regression can be found in tables A.14 and A.15 in the appendix.

The last estimate, which should be interpreted, is the correlation of the error terms of the dependent variables. A high correlation would indicate that there is at least one factor determining health and high job status, which has not been modeled correctly. This could be an omitted variable or an unspecified path in the model. Whereas there is a significant correlation of about 0.4 in the basic cross-sectional approach, the correlation in the final fixed-effects-models is very low (0.04) and not significant. This supports my view that the cross-lagged panel fixed-effects model adequately captures the causal mechanisms that are at work between health and job status. It is another indicator for the robustness of the results in my thesis.

For days of sickness absence the pattern is very similar to subjective health. Allowing for reversed causality does not have a strong influence on the estimated effects. Figure 5.21 presents the results from the cross-lagged fixed-effects model. Again there is only a significant effect for men in the private sector.

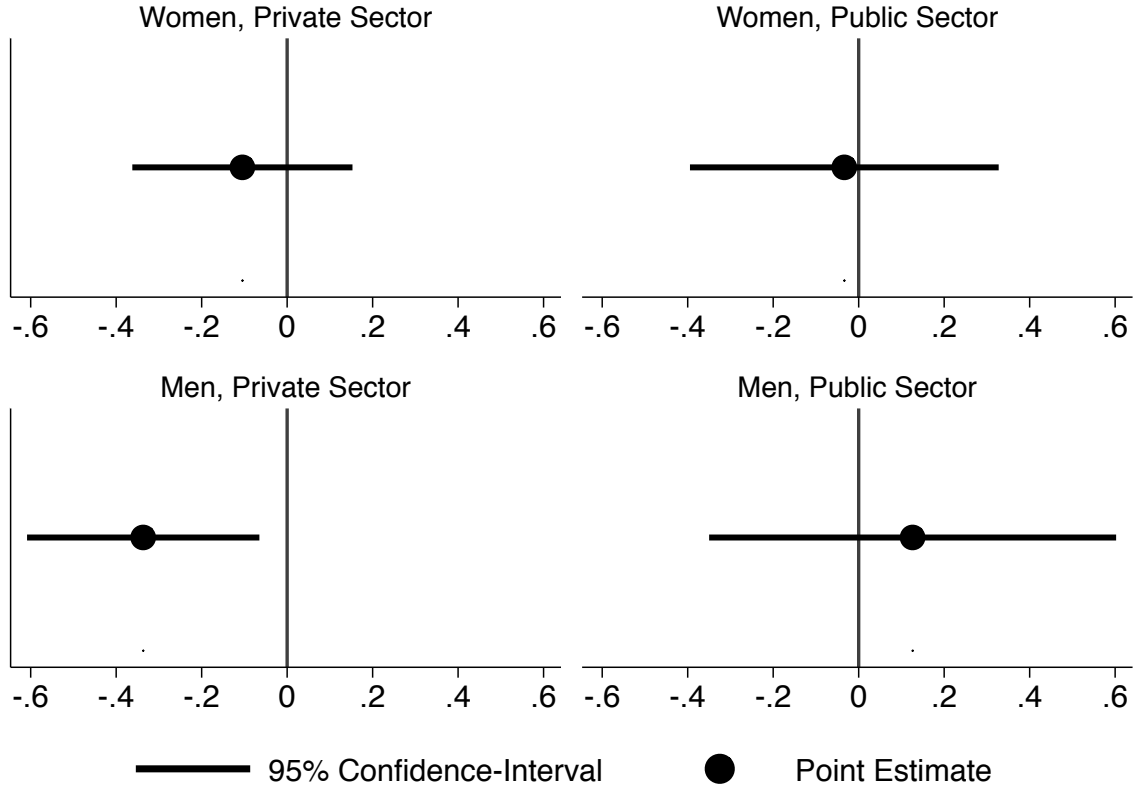
The reversed causal direction is presented in figure 5.22. Again, we see that there is no direct effect of job status when the set of control variables in introduced. If the controls are excluded stepwise we get the results in figure 5.21. The figure shows that the control variables do not have a substantial influence on the estimation of the coefficient of job status.

Only when we take a cross-sectional perspective we can that there is a effect of job status if the major control variables are not in the model (see figure 5.23). This association is however

not present in the longitudinal analysis.

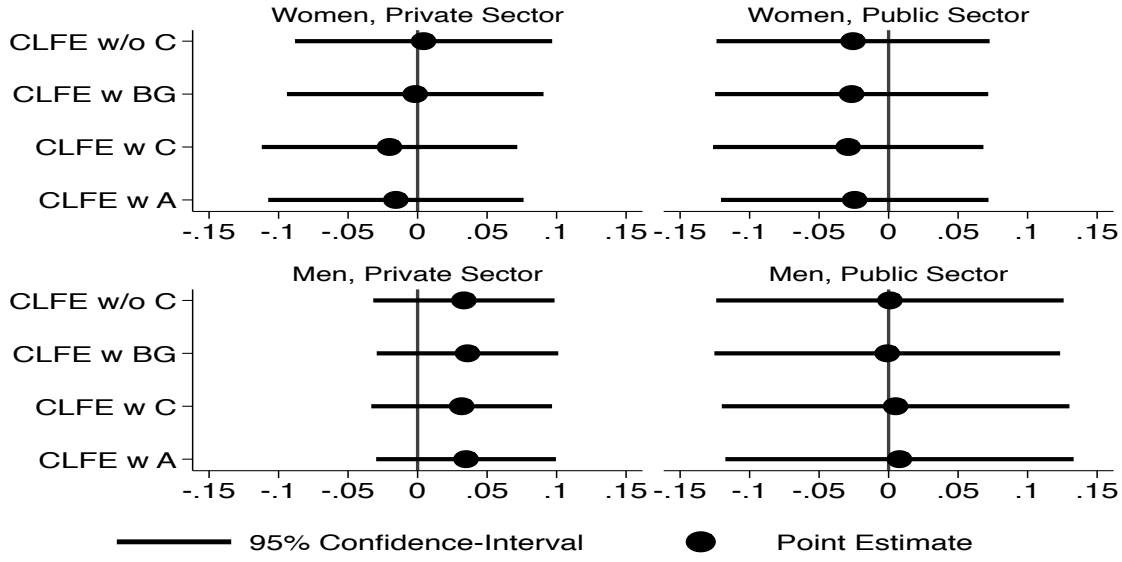
Key results from this section are: The cross-lagged approach yields the same results as the unidirectional analysis of health selection. In the private sector, subjective health is important for women, and sickness absence is important for men. A direct effect of job status on health can be found for women in the public sector, but not for any other constellation.

Figure 5.21.: log. Days of Sickness Absence Effects - Allowing for Reversed Causality in a Cross-Lagged Model with Fixed-Effects



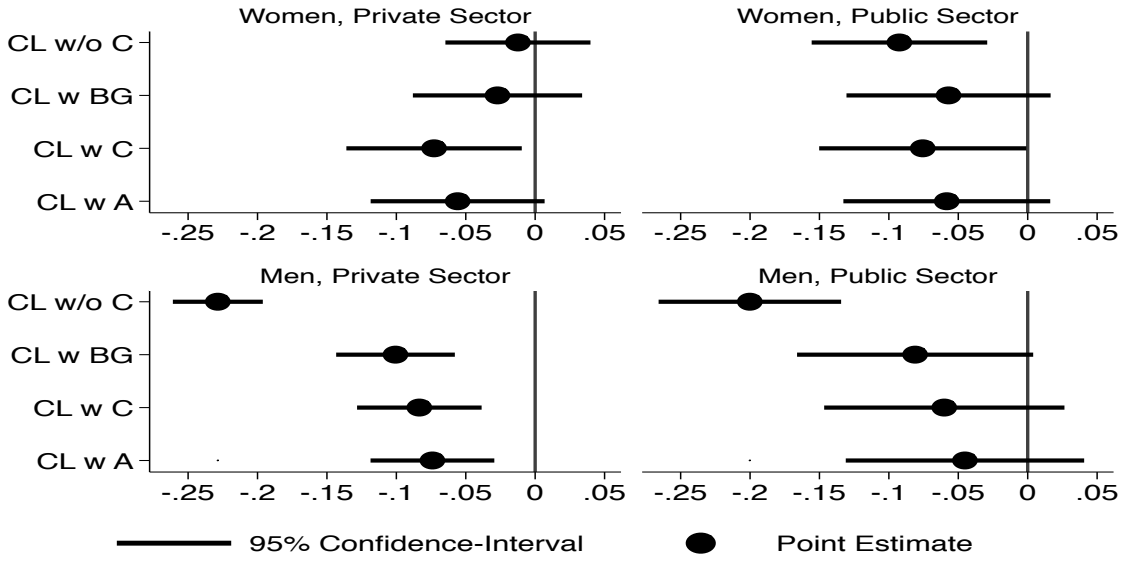
Note: The complete results of the regression can be found in tables A.16 and A.17 in the appendix.

Figure 5.22.: Effects of High Status Jobs on log. Days of Sickness Absence - Allowing for Reversed Causality in a Cross-Lagged Model with Fixed-Effects



Note: w/o C = without controls; w BG = with background characteristics (group 1); w C = with BG and job controls (group 2); w A = with anticipation effect (group 3). The complete results of the regression can be found in tables A.16 and A.17 in the appendix.

Figure 5.23.: Effects of High Status Jobs on log. Days of Sickness Absence in Cross-Section - Allowing for Reversed Causality in a Cross-Lagged Model



Note: w/o C = without controls; w BG = with background characteristics (group 1); w C = with BG and job controls (group 2); w A = with anticipation effect (group 3). The complete results of the regression can be found in tables A.16 and A.17 in the appendix.

5.8. Comparing the Health Effect to Other Predictors

In this part, I take a short look at the relative strength of the health effect in comparison to the influence of other predictors of job status.

As a reference for comparison I will use the influence of hours of work, overtime, and the amount of housework and childcare. These are useful variables for comparison, because they are factors that can be influenced by the workers, perhaps to compensate health problems. It allows fictional statements such as: How many hours do you have to work overtime to compensate my poor health? As a second point of reference I will use the baseline probability of being in a high status job. This allows us to judge whether the overall chance of job status change is affected in a sizable manner by individuals health. The comparison is based on the cross-lagged fixed-effects models from section 5.7.

Table 5.7 shows the x-standardized effects of health, housework and childcare, work hours, overtime, and age. These effects can be interpreted as the increase in the probability (in percentage points) of attaining a high status job if the independent variable changes by one standard deviation. Standardizing the results makes them comparable with regard to the magnitude of their effect despite the differences in scales. We can see that one standard deviation in health changes the probability of job status change by 0.24 percentage points for women in the private sector. I will only report relative strength for this subgroup, because all other effects are neither substantial nor significant. For women in the private sector this effect size is equal to the effect of housework and about half the size of work hours and overtime. The effect of age is by far the strongest - almost 10 times the size of the health effect - pointing to very gerontocratic structures in promotion schemes even in the private sector. A comparison to the public sector shows that the effects of age in the public sector are more than double in size. For men they are doubled again.
The baseline probability of being in a high status job is 11% for women in the private sector. This means that, relative to the baseline probability, one standard deviation change in health increases the probability of job status change by about 2.5%. These are not huge effects. However, they are still sizable and not of lesser importance than other important predictors of labor market rewards like the hours of work.

Table 5.8 presents the same comparison for the effect of sickness absence. It makes most sense to interpret the relative size of the coefficient for men in the private sector, because it is the only substantial effect. We can see that the magnitude of the effect is the same as the effect of subjective health for women. It is approximately 40 % smaller than the effects of housework and childcare, overtime, and work hours. Compared to the baseline probability the effect is considerably smaller than the respective effect for women's subjective health, as the overall baseline probability is considerably higher for men than for women. So while for

women in the private sector subjective health increases the probability of change in job status by 2.5% per standard deviation, for men in the private sector a standard deviation of log. days of sickness absence increases the probability of change in job status by a little more than 1%. Again age is a far more dominant factor in determining the probability of job status change.

Key results from this section are: For women in the private sector subjective health is a little less important than work hours, overtime, and about as important as childcare and housework for job status. The increase in probability is about 2.5%. For men in the private sector sickness absence is half as important as work hours, overtime, and about as important as childcare and housework for job status. The increase in probability is only about 1%.

Table 5.7.: Relative Size of the Health Effect Compared to Other Predictors of Job Status - in Percentage Points

	Women - Private	Women - Public	Men - Private	Men - Public
Subjective Health	0.246	0.047	-0.031	0.288
Housework/Childcare	-0.291	-0.061	-0.202	0.185
Hours of Overtime	0.439	0.518	0.190	-0.048
Hours of Work	0.433	0.831	0.319	0.141
Age	2.259	5.437	6.101	10.083
Baseline Value of High Status Job	11.11	18.36	29.21	33.75

Note: All effects are standardized.

Table 5.8.: Relative Size of the Effect of Sickness Absence Compared to Other Predictors of Job Status - in Percentage Points

	Women - Private	Women - Public	Men - Private	Men - Public
log. Days of Sickness Absence	-0.013	-0.033	-0.299	0.121
Housework/Childcare	-0.247	0.055	-0.177	-0.130
Hours of Overtime	0.635	0.703	0.434	-0.009
Hours of Work	0.597	0.691	0.409	0.218
Age	2.104	3.719	6.305	10.632
Baseline Value of High Status Job	9.87	16.47	25.32	30.12

Note: All effects are standardized.

5.9. Decomposing Overall Health Inequalities

In this last part of the analyses, I try to attribute the overall health inequalities to different explanatory approaches. These are:

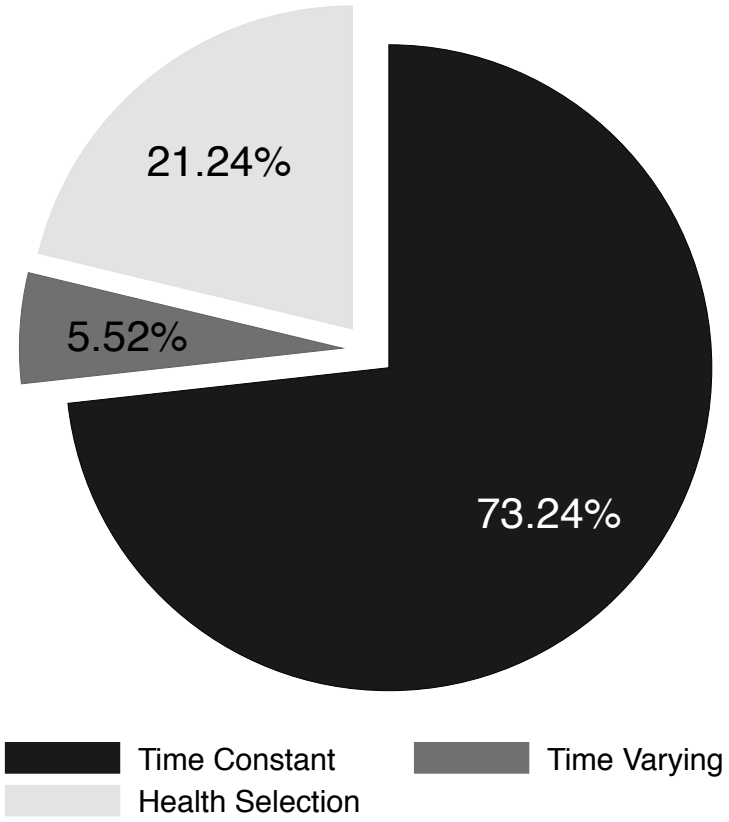
1. Health selection
2. Social causation
    a environmental-materialist
    b social-psychological
    c direct social causation
3. Third factors: Background characteristics

This presents a new perspective and also allows to test hypotheses **H9a** - **H9c**. I use the cross-lagged fixed-effects models in a slightly modified version (see section 4.8). This implies treating job status as if it were linear. Such a linear probability model has the advantage of reporting marginal effects as coefficients. The gross health inequalities which are decomposed in this section are measured by the cross-sectional association of health at time t with job status at time point t+1. This cross-sectional estimate of health inequalities does not presuppose any direction of causality, although technically health is used as the predicting variable.
In table 5.9 we can see to what degree the overall health inequalities, which can be found in a cross-sectional perspective, can be explained by taking specific variable sets as mediators. For **women in the private sector** a quarter of the inequalities can be explained by observed background characteristics, whereas demography plays almost no role (ca. 3%, group 1). Controlling for materialist-environmental social causation variables (group 2) does not explain much of the original health inequalities (3%). Taking social-psychological anticipation variables in account further explains about 6%, an estimate which is significantly positive according to the computed confidence interval (1.16; 11.29), but substantively small. State dependence, meaning the job status one year before (at time t) has a huge explanation power of about 55%. This suggests that time constant factors are extremely important as is also shown by the explanatory contribution of time constant factors, which is about 73% or almost three quarters, a highly significant effect. All time varying factors together only add up to 5% of the explanatory power, a non-significant estimate. Evaluated on their own only the social-psychological dimension has a time varying influence, similar to the overall explanation power of 6%. This means that except for this group of variables things that change over the period of observation actually do nothing to mediate health inequalities. The remaining effect, after all mediators are taken into account, is the health selective part of health inequalities which amounts to about 21%, a significant estimate. Figure 5.24[4] gives a visual impression of the relative contri-

[4]Women in the private sector are the only group in which such a graphical representation is possible. All other estimates include negative values that are hard to represent in a graph.

bution of time varying, time constant factors and health selection for women in the private sector.

Figure 5.24.: Women in the Private Sector: Proportion of Health Inequalities due to Factors which are...



For **women in the public sector** the picture looks different. Background factors and environmental-materialist factors are significant mediators of about 31% and 6% respectively. State dependency is even a little higher than for women in the private sector (61%).
Using a longitudinal approach we can see that almost all health inequalities (99%) can be traced back to time constant factors, time varying factors or selection do not play a role. This is an extreme case where any change during the period of observation does not influence health inequalities any more.

For **men in the private sector** demography is actually hiding part of the overall health inequalities (17%). Background characteristics play a major role in mediating health inequalities with 41%. Environmental-materialist and social psychological factors both contribute significantly with about 8%. State dependency amounts to 62% of the health inequalities.
Longitudinally we see that time constant factors make up more than 90% of the health inequalities. Time varying factors in their sum contribute nothing, although individually change in state (7%) and social-psychological factors (10%) play a significant mediator role. Health

selection is not significant.

Cross-sectionally the results are very similar for **men in the public sector** to men in the private sector. Environmental-materialist and social psychological factors have a similar size, but are not significant.
In the longitudinal perspective it is revealed that changes in demographics actually hide health inequalities. This is a sign for gerontocratic promotion structures which run counter to the fact that health deteriorates with age. Time constant factors make up 70% of health inequalities, time varying factors (except for demography) are not significant. Health selection is also not significant.

We can derive two major conclusions from this analysis. First, health selection is important only for women in the private sector. In this context, it explains about 20% of overall health inequalities. Second, explanations of health inequalities between regular and high status jobs vary widely between men and women and public and private sector. Depending on the context a different combination of background factors, social causation factors, and health selection determines the degree of health inequalities. Health selection factors are embedded in their social context. Their contribution to health inequalities cannot be judged to be high or low in general. Researchers have to make an effort to specify the contribution (or lack thereof) for the special case and the special context. Claiming insignificance of the contribution of health selection without a detailed analysis might be very misleading as this decomposition shows.

Table 5.9.: Decomposition of Health Inequalities - Subjective Health

	(1) Women - Private	(2) Women - Public	(3) Men - Private	(4) Men - Public
CS DEMO	-3.75	-4.80	-17.35	-18.10
	[-9.32;1.82]	[-14.64;5.03]	[-27.02;-7.68]	[-33.26;-2.94]
CS BG	21.93	33.80	41.56	44.63
	[13.85;30.01]	[16.95;50.66]	[30.05;53.07]	[26.69;62.56]
CS E-M	2.91	6.34	8.68	2.87
	[-0.91;6.73]	[0.40;12.28]	[4.80;12.57]	[-2.11;7.84]
CS S-P	6.22	7.58	8.43	6.70
	[1.16;11.29]	[-1.05;16.21]	[4.20;12.65]	[-1.10;14.50]
CS STATE	55.22	61.99	62.95	59.83
	[32.09;78.35]	[20.52;103.47]	[42.65;83.25]	[23.46;96.20]
TV DEMO	16.88	-27.46	-48.92	-157.98
	[-6.77;40.53]	[-83.89;28.97]	[-122.81;24.97]	[-305.29;-10.67]
TV BG	-11.26	30.72	45.32	158.49
	[-38.90;16.38]	[-15.19;76.64]	[-40.59;131.22]	[-4.43;321.42]
TV E-M	-8.82	1.12	-3.93	5.56
	[-16.10;-1.55]	[-26.37;28.61]	[-10.86;2.99]	[-11.19;22.31]
TV S-P	6.20	-8.34	9.50	7.94
	[0.03;12.36]	[-19.20;2.53]	[4.26;14.74]	[-2.99;18.87]
TV STATE	2.52	0.54	7.33	2.16
	[-1.05;6.10]	[-4.73;5.81]	[3.68;10.98]	[-3.78;8.10]
Total TC	73.24	99.34	92.50	70.93
	[31.35;115.13]	[23.46;175.23]	[59.72;125.28]	[10.42;131.44]
Total TV	5.51	-3.41	9.29	16.18
	[-19.89;30.91]	[-47.91;41.09]	[-11.78;30.35]	[-28.80;61.16]
Health Selection	21.24	4.07	-1.78	12.89
	[0.72;41.76]	[-31.67;39.80]	[-16.49;12.92]	[-16.55;42.33]

Note: CS: cross-sectional; TV = time varying; TC = time constant; DEMO = demography; BG = background characteristics; E-M = environmental materialist factors; S-P = social psychological factors; STATE = state dependency

Table 5.10 contains the same results for the decomposition of health inequalities measured by log. sickness absence. Decomposing the inequalities in sickness absence yields the following results. For **women in the private sector** the cross-sectional perspective shows that background characteristics and social-psychological factors reduce inequalities tremendously (about 100% and 50% respectively) while environmental-materialist factors actually invert health inequalities. State dependency and demographic factors do not play a significant role. The longitudinal analyses show that both time constant and time varying factors are strongly associated with explaining health inequalities, but with opposing signs. Both estimates show huge ranges of the confidence-interval. Individually environmental-materialist and social-psychological factors have the same direction of effect as in the cross-sectional analysis. Health selection does not play a significant role.

Health inequalities in sickness absence of **women in the private sector** can be decomposed in small to associations with background characteristics, and in large part to state dependency. This is reflected in the longitudinal analysis as well. Time constant factors significantly reduce health inequalities, time varying factors and health selection do not play a role. Time varying social-psychological factors actually lead to a small increase in health inequalities.

The cross-sectional perspective on **men in the private sector** reveals, that a fifth of health inequalities can be attributed to background factors, a small portion (ca. 5%) to environmental-materialist factors, and a big portion to state dependency (ca. 60%). The longitudinal perspective shows some unusual results. First, on its own, change in background characteristics partly explains health inequalities. Then a change in state dependency makes also a significant, although small contribution (5%). That would mean that a change in job status at time point t partly mediates the fact that health at t influences job status at t+1. Taken together time constant factors account for almost $\frac{3}{4}$ of health inequalities. However, both health selection (7%) and other time varying factors (20%) also make a significant contribution. Health selection is, relatively to other factors, less important in explaining health inequalities in sickness absence than in general health.

For **men in the public sector** we can see that mostly state dependency (60%), background characteristics (25%) and to a small degree environmental-materialist factors (4%) are associated with health inequalities. Interesting is that in the longitudinal perspective, no one time varying factor is significantly associated with health inequalities, together they explain an estimated third of health inequalities, with two thirds explained by time constant factors. Health selection has no independent contribution.

Key results from this section are: Health selection explains health inequalities only in the private sector. For subjective health it explains about a fifth of overall health inequalities between female high and regular status job incumbents. For men and for sickness absence the contribution is only about 7%. Time constant factors are by far the most important explanatory force for health inequalities between job status. This indicates that during labor market trajectories job status only has limited independent impact on health inequalities, and health inequalities due to job status do not change much over time.

Table 5.10.: Decomposition of Health Inequalities - log. Days of Sickness Absence

	(1) Women - Private	(2) Women - Public	(3) Men - Private	(4) Men - Public
CS DEMO	8.20	0.00	0.35	-0.86
	[-3.55;19.94]	[-2.43;2.42]	[-0.22;0.92]	[-3.13;1.41]
CS BG	107.47	18.58	20.64	25.90
	[26.08;188.86]	[5.28;31.89]	[17.85;23.44]	[18.64;33.15]
CS E-M	-225.20	-3.01	6.26	3.56
	[-282.01;-168.39]	[-8.92;2.89]	[4.77;7.76]	[1.39;5.74]
CS S-P	45.48	3.34	0.79	1.41
	[19.08;71.89]	[-0.20;6.88]	[0.17;1.42]	[-0.22;3.05]
CS STATE	35.01	62.63	61.71	60.96
	[-204.46;274.47]	[26.57;98.69]	[53.87;69.56]	[42.19;79.73]
TV DEMO	25.78	-3.38	0.25	-7.68
	[-22.61;74.17]	[-16.82;10.07]	[-1.85;2.34]	[-29.31;13.96]
TV BG	-106.12	12.09	11.41	38.56
	[-334.85;122.61]	[-20.82;45.00]	[2.65;20.18]	[-0.41;77.53]
TV E-M	-204.59	-5.01	1.03	0.85
	[-309.33;-99.86]	[-22.81;12.79]	[-0.50;2.55]	[-3.43;5.14]
TV S-P	50.93	-4.90	1.13	1.26
	[16.30;85.56]	[-9.39;-0.42]	[0.31;1.95]	[-0.92;3.43]
TV STATE	0.68	-0.33	5.69	1.60
	[-4.46;5.81]	[-5.92;5.27]	[2.67;8.70]	[-4.43;7.62]
Total TC	247.92	104.94	73.66	63.12
	[-171.59;667.42]	[42.32;167.56]	[59.36;87.95]	[28.77;97.46]
Total TV	-233.33	-1.53	19.50	34.60
	[-478.44;11.79]	[-34.77;31.72]	[9.16;29.84]	[5.64;63.55]
Health Selection	85.43	-3.42	6.84	2.29
	[-124.82;295.68]	[-34.32;27.48]	[1.32;12.37]	[-8.82;13.40]

Note: CS: cross-sectional; TV = time varying; TC = time constant; DEMO = demography; BG = background characteristics; E-M = environmental materialist factors; S-P = social psychological factors; STATE = state dependency

5.10. Summary of Results

Before coming to the major conclusion a summary of the results is useful. I will structure the summary around central questions and hypotheses. The summary will cut across the different subsections of the results chapter to synthesize the findings from different model specifications. The summary is supposed to conclude how health selection works in a non-technical manner by discussing and answering 4 major questions of the thesis. At the end of this section table 5.11 presents a schematic overview of the hypotheses and shows whether they can be accepted or not based on the analyses.

5.10.1. Does Health Selection Contribute to Job Status Related Health Inequalities?

In the descriptive part of the analyses we could see that there are health inequalities between workers who have regular jobs and workers who have high status jobs. These inequalities are stronger in the private than in the public sector and stronger among women than among men. The main question was whether health selection contributed to these health inequalities. The estimates of the fixed-effects-logit models and of the cross-lagged fixed-effects models suggested that we can only identify a contribution of health selection to health inequalities for women in the private sector. This mainly confirmed the hypotheses proposed in the theoretical part of the thesis that health effects are stronger for women. The fact that there was no health effect for men in the private sector supports the hypothesis that in contrast to women, men do not adjust their effort at work if faced with impaired health. As expected, in the public sector health did not influence job status. This is in line with the argument that a more bureaucratized promotion scheme leaves little room for health related performance effects on job status.
What could also clearly be seen by the results of the survival analysis is that health selection works at the entrance to high status jobs. For women in the private sector, the group where a health selection effect could be established, only the health of applicants to high status jobs works selective. There was no downward health related mobility, only hindrance of upward mobility. This makes sense if we view high status jobs as closed positions where firing the employee is not possible without substantial costs to the employer. Occupying high status jobs makes workers invulnerable to health related reduction of performance.

The answer is: Health selection contributes to health inequalities only for women in the private sector (20%). For sickness absence the contribution is strongest in male dominated jobs. Note that social causation explains even less of health inequalities. The major parts are explained by common background factors.

5.10.2. Does Social Context Matter?

The preceding paragraph already stated that health selection does not occur in the public sector. This is one important way of showing that social context in the form of rules, contracts or traditions influences the way health inequalities are generated. Far from being a natural law it lies well within the power of society to shape employment relations in a way that health is not an important selective factor.

Is the state as an employer necessary to insure that health selection does not contribute to health inequalities? Or is there evidence that in certain parts of the private sector there are also no selection effects? For this purpose different forms of occupational closure in the private sector were investigated. Jobs which have a low knowledge intensity are not well guarded against competition from outside. On the other hand, the more professionalized an occupation is the less important health selective factors are. So health selection can be stronger or less strong depending on the type of occupation one works in.

This could also be seen with regard to gender proportions in jobs. The "glass-escalator" hypothesis stated that in jobs with a high percentage of women, men should have an easier time getting a promotion than women. Therefore health should be primarily important for women in female dominated jobs. And indeed health is a selective factor for women, but not for men, in female dominated occupations.

In male dominated jobs women seem to have a token status with regard to sickness absence. A culture of presenteeism leads to moderate selective effects for men and strong selective effects for women. The effects of women are subject to a high uncertainty due to small numbers and should be treated with caution.

These results highlight the importance of social context for health selection processes. In light of these results it seems unreasonable to reduce the process of health selection to something biological or natural.

In table 5.11 we can see if different overlaying contexts, positions and social roles produced health selection or not. If the cells are colored white, it indicates that the theory would expect a closed position and thus no health selection, gray indicates the opposite. The large X show where health selection effects could be found. Minus stands for no substantial health selection effects. The table provides visual evidence that certain circumstances disallow health selection. Or put differently, it shows that we need to search for an intersection of open positions as context for health selection to find competition and health selection. The table also shows that for both men and women there is one unexpected lack of health selection each. For women we have no health selection on the visible health measure[5], for men no health selection on the non-visible measure. This shows that gender plays an important role, not always on the individual level, but also on the occupational level.

[5]Except in male dominated occupations.

Table 5.11.: Health Selection in Open and Closed Positions

			The Situation is...					
		Sector	Public Sector		Private Sector			
		Occupation			Open Occupations		Closed Occupations	
		Health is ...	visible	non-visible	visible	non-visible	visible	non-visible
Worker is...	Male	Incumbent	-	-	-	-	-	-
		Applicant	-	-	**X**	-	-	-
	Female	Incumbent	-	-	-	-	-	-
		Applicant	-	-	**(X)**	**X**	-	-

Note: X= effect found; - = no effect found; Gray Cells = HS is expected; White Cells = HS is not expected

The answer is: Health selection can only be found in open positions where competition is possible. Gender is a moderator on the individual and on the occupational level. Context is highly important to health selection processes.

5.10.3. What is More Important: Health Selection, Social Causation or Third Factors?

So what relative contribution does health selection make to the explanation of health inequalities? Concluding from the two preceding paragraphs we can say that in non-competitive environments and for men the contribution is probably negligible, because we cannot even establish substantial effects in the models.

But what contribution does health selection make for women in the private sector? The effects were statistically significant, but are they also important? A decomposition of the overall health inequalities suggests that about one fifth of the health inequalities can be attributed to health selection. This does not make health selection the strongest factor, but hardly so little that it can be safely ignored. Third factors make up about half of the health inequalities. Social causation in the form of social-psychological factors can explain about a quarter of the effect. The comparison of cross-sectional and fixed-effects models indicates that it is mostly time constant characteristics of incumbents of high status jobs, which gives them an advantage over incumbents of regular jobs. However, for women in the private sector the only major time varying factor is health selection. This is interesting, because it suggests that at a certain point in time health inequalities do not change anymore, except through selection processes.

For men and in the public sector time constant factors, and to a smaller degree social-psychological factors are the driving force of health inequalities. Here health selection is actually a factor which can be ignored.

For sickness absence health selection plays a certain role in male dominated occupations, but overall time constant factors prevail here as well.

The answer is: Common background factors are by far the most important determinant of job status related health inequalities. Health selection plays a substantial role in certain contexts. Social-psychological factors play a small role for men. Even taken together health selection and social causation are far less important than background factors.

5.10.4. Are There Gender Differences in Health Effects?

What do the results tell us about gender differences in health selection? The general hypothesis was that health should have a stronger impact on women's job status than on men's. Overall this was supported. The theory offered two explanations for this gender difference. One was gender specific disadvantage in performance evaluation which necessitated a stronger reliance on health on the part of women. The other explanation stated that men simply do not adjust their effort at work to a change in health status.

I think that the results favor the second explanation. There was absolutely no direct effect of subjective health on job status for men, whereas the first explanation would merely expect a reduced effect in comparison to women. On the other hand, as soon as men were absent from work their job status becomes subject to change, decreasing the chance of upward mobility. This indicates that a deviance from the presenteeism culture of male work environments is also penalized for men.

The fact that in various contexts of occupational closure it was only women's health effect which is moderated also speaks in favor of a general invariance of effort with regard to subjective health among men.

However, we should be careful at this point not to overstate these interpretations. A direct test of explanation 1 versus explanation 2 was neither conducted nor is it possible with the data used in the thesis. It should also be mentioned that the two explanations are not absolute statements and are not mutually exclusive.

The answer is: Gender matters for health selection. Men and women are not affected in the same way by their health. For sickness absence gender matters especially as an interaction of the gender proportion on the occupational level and individual gender. This suggests that simple separated regression analyses will not always account for all gender differences.

6. Conclusion

6.1. Overview

I started my thesis by noting that health is important to individuals across societies, and is consequently the subject of government policies. Yet, I wondered whether it is more than a goal in itself, a resource which allows us to be successful in society. This would also imply that health inequalities could be the result of advantages or disadvantages individuals face due to their health state. I elaborated on the idea that health selection might be a driving force in labor market processes and the generation of health inequalities. Now it is time to reflect on the theoretical arguments and the empirical analyses to see how my theory fares and what kind of contribution it can make to research on health inequalities.
I start by summarizing the theoretical and methodological approach of the thesis highlighting the new features developed in this context. In the next section a very brief summary of the key findings[1] and of some unanswered questions follows.
The third part will mention the most important caveats and limitations of the study known to me. This is done both for reasons of scientific rigor and as a connection to the last part of the conclusion that suggests different fields of further research, which derive from both unresolved questions and limitations of this thesis.
I will then go on and conclude what my findings mean for the theory and how the theory could be generalized beyond the context of the labor market. Finally, I make some suggestions for future research.

The theoretical questions of the thesis were: Through what mechanisms does health selection influence health inequalities in society? And, are these mechanism natural or social processes? The line of argument criticized widespread claims that health selection is a pseudo-biological or natural way of explaining health inequalities and that it could be empirically disregarded. My critique was based on the claim that there is actually no coherent theory of health selection. Consequently the mechanisms lying behind the hypothesis remain opaque in most studies. It became clear that health selection should be interpreted as a social process. In addition, the circumstances, namely the degree of competitiveness and socialized health behavior, should have a major influence on health selection.
For the example of job status it was concluded that in open positions, like the private sector,

[1] A longer version can be found at the end of the previous chapter.

health selection matters while in closed positions, like the public sector, health selection is negligible. At the same time structural factors like labor market disadvantages of women and socialized differences in health behavior lead to stronger health selection effects for women than for men. Another important distinction with regard to closed positions is between incumbents and applicants to certain positions. Incumbents of closed positions do not face health selection while applicants to closed positions do.

My statistical approaches for testing the hypotheses included several novelties. First, the comparability of measures of subjective health across the important groups was tested. The latent variable approach I chose addressed the debate in the scientific literature about the comparability of self-rated health across gender, time, and status empirically without having to rely on purely theoretical arguments. The models of the confirmatory factor analyses showed that comparability in the SOEP is not a problem for the groups under scrutiny. Second, a cross-lagged panel model with fixed-effects was introduced complementing the standard fixed-effects logistic regression and survival analytic models. The cross-lagged panel model takes time constant unobserved factors and observed time varying factors into account. Both might lead to spurious correlation in the relationship between health and job status. In addition, it takes reversed causality into account allowing both health to influence job status and vice versa. The variety of models chosen reflects varying requirements according to different sub-questions and can be seen as a robustness check of the results. Third, a decomposition approach of health inequalities was undertaken. In contrast to previous attempts in the literature, this decomposition approach explicitly models the part of the health inequalities between regular and high status jobs associated with time constant factors. To the best of my knowledge it is also the first study which provides a confidence interval not only for mediating observed variables, but also for the time constant factors as a whole.

6.2. Key Results and Unresolved Questions

The study presented here is the first to investigate the effect of health on job status for Germany. Generally, in the literature there are very few studies linking health and job status, favoring wages, employment, or SES depending on the disciplinary background. My thesis is also one of the few studies making a systematic comparison of an - for the employer - unobservable (subjective) health measure, self-rated health, with an observable (objective) measure, days of sickness absence.

If we want to use a less scientific language, the empirical examples from the German labor market can be broken down to the following statements.

- If you are a woman, health is an important asset if you want to get a good job in the private sector.
- If you work in an occupation which is dominated by men, do not call in sick too often or your chances of a good job are dwindling.
- Do not expect a change in job status to matter too much for your health. At the point in your life when you compete for such jobs, the harm is already done. What matters for health and inequalities in health happens before.

A more detailed look on the analyses yields the following picture:
Health selection was a substantial factor in explaining health inequalities between persons of high and normal job status. These substantial effects could only be found in open positions on the labor market (private sector, low knowledge intensity). There are considerable differences between genders. With regard to subjective health only women appear to be selected according to health. In female dominated occupations a "glass-escalator" effect of health can be seen favoring men over women. For sickness absence, it seemed at first that the reverse was true. Only men seemed to be selected by the number of days of sickness absence. However, more detailed analyses showed that it is mainly in male dominated occupations where selection with regard to sickness absence occurs. The social context in which health selection takes place is therefore very important. Taking reversed causality into account did not change these results. It is also important to note that applicants to closed positions seemed to be subject to stronger selective effects than incumbents of such positions.
The strongest explanation of health inequalities between regular and high status jobs was due to time constant factors. These are most likely determined before the period of observation, maybe even before the entry into the labor market. For women health selection with regard to subjective health made up the greater part of the remaining variation. Actual changes in job status could therefore only account for one sixth of health inequalities not explained by time constant factors. This makes health selection much more influential for women in the private sector. For all other defined groups health selection did not play a role. Social causation in form of social-psychological factors can explain most of the time varying health inequalities for men in the private sector.

Some questions remain unanswered:
Is the difference between incumbents and applicants in selective effects due to an actual difference in effects or due to a lack of statistical power of the estimator? Replication with larger samples or under circumstances of more events could provide clues to answer this question.
Is the difference in health selection effects between men and women due to different health behavior, disadvantage or both? The data does not allow to test this directly. The fact that there is virtually no health selective effect for men regardless of model specification or context

speaks in favor of the health behavior explanation. However, the "glass-escalator" effect of men in female dominated occupations suggests that disadvantage might also play a part. We are therefore left with an unsatisfactory conclusion: Both mechanisms are probably at work, but we cannot tell which one is more important.

6.3. Caveats and Limitations

My thesis has some potential problems and limitations. The most important of these shall be mentioned now.

1. Restriction to the German labor market
2. No life course perspective
3. No integration of social causation and health selection theory
4. Health as an exogenous variable; no natural experiment

The first limitation is that I restricted my analyses to individuals who are part of the German labor market. Also excluded are self-employed persons and all those who are not yet or not anymore employed. The results presented here are therefore not fit for generalization to other labor markets, self-employed, retired persons, or those still in the educational system. Nonetheless, the theory allows to make predictions for other groups as well and the integration of the theory of open and closed position is a good starting point to state context sensitive hypotheses about health selection in other contexts.

The second challenge is that the theory so far only throws a spotlight at a random point in the life course of an individual. It does not take into account the career and health trajectory nor the outlook of the individual. A theoretical framework which allows the integration and the age dependency of such relations would yield a more coherent view on health selection processes. One might find that health selection is of special importance during certain periods of life while during others it is of little importance. A life course perspective would also allow to integrate selective mechanisms before entry into the labor market. The theory of Galama & van Kippersluis (2010) shows how such a life course perspective could look like. However, it does not deal with heterogeneous and context sensitive selection mechanisms. This could be a starting point for integrating the theories.
A life course perspective could also overcome the third major limitation of the thesis. I did not provide an integration of social causation and health selection hypotheses. Such an integrated theory would imply that reciprocal causation over the life course is explicitly modeled. The relative importance of health selection and social causation in explaining health inequalities

might also vary over the life course. Galama & van Kippersluis's (2010) theory integrated with the theory of health selection could be a good foundation for a reciprocal theory of health inequalities.

Yet another closely related issue is that I treat health as an exogenous variable throughout the thesis. As soon as a life course perspective is taken this assumption is not feasible anymore. Decisions about health behavior and health related labor market decisions will influence future health. At least to a certain degree this will be reflected and taken into account by individuals. At this point health becomes endogenous to decisions and events in the individuals' lives at an earlier point in the life course. Strategic investments in health should therefore be a part of future developments of the health selection theory.

Certain methodological schools of thought would argue that the absence of a natural experiment in this thesis is also a weak point in the argument. For the empirical analyses no external quasi-random variation was used to ensure that the estimated effects are causal in the sense of the counter-factual argument. One such approach would have been an instrumental variable estimation approach. However, finding such an instrument is hard, and the results are sometimes unclear and limited in time and context with regard to their actual interpretation in terms of causality (Stowasser, Heiss, McFadden & Winter 2011, 10).

In defense of the approach taken, I want to make two points. First, the methods chosen go a long way in making the conditional independence assumption plausible. In my opinion, it is the strongest test possible given the subject of inquiry. Second, a focus solely on topics where natural experiments occur would lead away from answering theoretically interesting research questions towards forming research questions around natural experiments. Such an approach to research designs will not take into account whether a research question is important or not. Consequently, certain fields in social sciences would become completely understudied. This holds true for health research and research on subjective health in particular, but to a certain extend it also applies to labor market research.

6.4. Generalizing the Theory of Health Selection

How can we generalize the theory of health selection to bring it into accordance with the findings from the study? At this point, it seems useful to construct a list of necessary conditions which need to be fulfilled so that a health selection mechanism might contribute to the explanation of health inequalities.

One sufficient condition would be the existence of formal health criteria for entering a social positions. In such cases health selection is made explicitly. If a person fails a certain criteria he or she cannot attain the position. These positions will only be occupied by individuals who show a certain health profile. For example, pilots need to pass physical examinations before and during their employment which are often regulated and demanded by law. Civil servants in Germany need to pass a medical check up, where among other things the BMI should not be

higher than a certain threshold.
Another sufficient condition for health selective mechanisms are health related discriminatory practices. This is most likely the case for stigmatized diseases or health limitations. One could think of HIV, physical disabilities, or certain conditions like epilepsy. Here the question of visibility arises. Is there a direct or an indirect way for employers or other institutions, which select individuals, to recognize such a stigmatizing health impairment?
If none of these two sufficient conditions are present, the following two conditions are conditionally necessary:

1. competition through performance
2. performance depends on health

These four conditions (two sufficient, two conditionally necessary) lead to the following logical set of conditions for health selection. Formal health criteria (F) are a sufficient, but not a necessary condition for health selection. Health discrimination (D) and visibility (V) are also jointly sufficient, but not necessary. The third way is a selection according to performance (P), given that performance is dependent on health (P|H). Performance depends on health if effort is adjusted according to health status, and the individuals are face a situation of competition (C). Note that these conditions include self-selection, because if either performance does not depend on health or there is no competition, than there would be no incentive for self-selection. In all three cases a selecting actor needs to exist (A).
So we can state the following logical condition for health selection processes. A social context (SC) allows health selection (HS) if it has one or more of the four elements listed above.

$$SC \in HS \rightarrow A \wedge (F \vee (D \wedge V) \vee (P|H \wedge C)) \tag{6.1}$$

From this logical scheme various sub-theories and hypotheses can be derived about the relationship of different health conditions and various social positions or social outcomes. The next section elaborates a little more on possible further research which is based on a generalization of the theory of health selection.

6.5. Further Research

Is there potential for further research after the investigations of this study? I think so and will give some examples below. There are a lot of areas which can be studied using the approach of this thesis. They can be categorized as follows:

1. Theoretical developments
2. Non-labor-market applications

3. Generalization to other contexts

One important step in the theoretical development would be to integrate the individual level with the macro level. In particular, an investigation should be started into how overall social inequalities influence health inequalities generated by health selection. Here, work by authors like Wilkinson & Pickett (2009) could be picked up. They investigated the relationship of health inequalities and overall health status of societies and social inequalities in these societies. However, the argument was dominated by a social causation explanation of health inequalities. From the theory of health selection we could derive a preliminary hypothesis that socially unequal societies have stronger selection mechanisms at least with regard to selection on social characteristics. These societies might in general be more competitive. This could well lead to stronger selection in the educational system or on the labor market with regard to health of the individuals. A complementary explanation of the association between social inequality, level of health, and health inequalities on a societal level might arise from such results. It is definitely an area which promises great research opportunities and that could use parts of the theoretical insights from this thesis to develop a theory that allows for micro-macro interaction to predict societal outcomes of health selection.

A different field of research is the comparison of educational systems with regard to their selectivity not only on social characteristics, but also on health characteristics. A lot of research has compared educational systems with regard to their moderating function on the effect of children's and adolescents social background on their educational achievement. In particular, there are several studies dealing with the impact of educational systems on children's and adolescent's health (Zambon, Boyce, Cois, Currie, Lemma, Dalmasso, Borraccino & Cavallo 2006, Hurrelmann, Rathmann & Richter 2011, Richter, Rathman, Gabhainn, Zambon, Boyce & Hurrelmann 2012). There are also studies estimating the impact of different health conditions on educational achievement. But studies focusing on the interaction between educational system and the degree of health related selectivity are rare. Thus, the theory of health selection could be fruitful in making predictions which could then be tested empirically across different school or university systems.

The last area for further research is a search for context sensitivity of health selection. The present study already made several such tests and showed that e.g. the occupational context, or gender matter for health selection. However, the study was restricted to an analysis of the German labor market. Given that the claims of health selection theory are fairly general it is possible to look at other labor market constellations in other countries or at other points in time. It could be investigated whether the predictions hold in different contexts or whether under certain conditions health selection theory fails to provide useful hypotheses. It would be very interesting to see how the theory fares in countries where the general level of public health is much lower than in most of the OECD countries. Does this lead to stronger selection

processes due to more severe conditions among the working population? Or are working and living conditions at the same time so much more important for determining health outcomes that health selection does not contribute anything in the explanation of health inequalities? In any case, there are countless possibilities to use other data sources from different contexts to further test and develop the health selection therory. My thesis provided the first stepping stone.

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A. Appendix

A.1. Results Tables

Table A.1.: The Effects of Subjective Health on Job Status

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
Subjective Health	0.198	-0.005	0.005	0.100
	(0.099)	(0.118)	(0.071)	(0.170)
Age	0.440	0.555	0.371	0.685
	(0.107)	(0.146)	(0.107)	(0.219)
Age^2	-0.006	-0.006	-0.005	-0.005
	(0.001)	(0.001)	(0.001)	(0.002)
East Germany	0.591	0.340	-1.113	0.968
	(0.754)	(0.906)	(0.498)	(0.807)
Years of Education	0.025	0.019	0.178	0.254
	(0.111)	(0.118)	(0.078)	(0.168)
Years of FT experience	0.031	-0.058	0.004	-0.256
	(0.043)	(0.046)	(0.087)	(0.121)
log. Wage per Hour	0.139	0.256	0.481	0.259
	(0.181)	(0.256)	(0.148)	(0.294)
Job tenure	0.085	0.007	0.031	-0.071
	(0.021)	(0.029)	(0.010)	(0.070)
Hours of work	0.030	0.034	0.015	0.012
	(0.009)	(0.012)	(0.008)	(0.020)
Hours of overtime	0.046	0.039	0.010	-0.025
	(0.016)	(0.022)	(0.009)	(0.025)
Size of HH	-0.136	0.171	-0.133	-0.174
	(0.129)	(0.164)	(0.088)	(0.215)
Number of children in HH	-0.320	-0.141	-0.001	0.116
	(0.166)	(0.190)	(0.084)	(0.175)
Marital status: Single	-0.053	1.573	-0.211	-0.019
	(0.298)	(0.606)	(0.224)	(0.455)
Marital status: Other	-0.178	-0.366	-0.315	-0.306
	(0.284)	(0.410)	(0.223)	(0.554)
Amount of housework+childcare	-0.081	-0.017	-0.059	0.022
	(0.028)	(0.034)	(0.027)	(0.055)
Age of youngest HH-member	-0.009	0.016	-0.017	-0.026
	(0.011)	(0.012)	(0.007)	(0.016)
Firmsize: $<$ 5	0.241	-21.940	0.352	-0.269
	(0.296)	(22389.620)	(0.245)	(1.192)
Firmsize: 20-199	0.202	0.214	-0.104	-0.101
	(0.223)	(0.317)	(0.158)	(0.564)
Firmsize: 200-2.000	0.296	0.570	-0.310	-0.220
	(0.264)	(0.352)	(0.183)	(0.582)
Firmsize: $>$ 2.000	0.570	0.860	-0.356	-0.391
	(0.287)	(0.359)	(0.200)	(0.623)
Branch: Agriculture and fishing	2.103		-1.229	-1.197
	(1.390)		(0.809)	(2.361)
Branch: Energy and water supply	-0.603		0.161	0.300
	(0.969)		(0.455)	(2.062)
Branch: Construction	0.581		0.198	0.255
	(0.744)		(0.230)	(2.278)
Branch: Wholesale, hotel and restaurant industry	-0.035	22.969	0.193	1.333
	(0.309)	(.)	(0.171)	(1.466)
Branch: Transportation and information	-0.666	21.447	0.008	0.910
	(0.577)	(54643.324)	(0.314)	(2.225)
Branch: Financial intermediate	-0.135	1.374	-0.566	-0.565
	(0.579)	(34259.349)	(0.424)	(2.214)
Branch: Real estate, law counseling	0.288	-0.502	-0.267	0.508
	(0.357)	(34259.349)	(0.219)	(2.174)
Branch: Public Administration	0.552	0.444	0.169	0.050

Table A.1 – *Continued from previous page*

	(0.393)	(34259.349)	(0.424)	(2.065)
Branch: Public and private Services	0.057	-0.021	0.181	0.536
	(0.391)	(34259.349)	(0.258)	(2.048)
Psychological strain of occupation	0.053	-0.191	0.042	-0.102
	(0.036)	(0.062)	(0.024)	(0.065)
Physical strain of occupation	-0.107	0.174	-0.085	0.046
	(0.056)	(0.100)	(0.026)	(0.071)
Great Worries about job security	-0.312	-0.145	-0.214	-0.194
	(0.174)	(0.220)	(0.115)	(0.321)
Great Worries about own economic situation	0.394	0.169	0.052	0.106
	(0.154)	(0.181)	(0.109)	(0.263)
Satisfaction with work	0.079	-0.047	0.076	0.100
	(0.031)	(0.042)	(0.022)	(0.054)
Observations	3291	2098	6564	1351
Individuals	511	319	933	208

Note: Standard errors in parentheses.

Table A.2.: The Effects of log. Days of Sickness Absence on Job Status

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
log. Days of sickness absence	-0.034	0.024	-0.069	0.009
	(0.044)	(0.053)	(0.022)	(0.054)
Age	0.411	0.298	0.398	0.522
	(0.109)	(0.146)	(0.065)	(0.144)
Age^2	-0.005	-0.004	-0.005	-0.004
	(0.001)	(0.001)	(0.000)	(0.001)
East Germany	0.436	0.232	-0.406	0.372
	(0.798)	(0.896)	(0.372)	(0.699)
Years of Education	0.010	0.050	0.136	0.185
	(0.114)	(0.117)	(0.048)	(0.089)
Years of FT experience	0.044	-0.053	0.029	-0.129
	(0.043)	(0.046)	(0.049)	(0.082)
log. Wage per Hour	0.083	0.312	0.532	0.193
	(0.185)	(0.263)	(0.102)	(0.253)
Job tenure	0.082	0.006	0.034	-0.009
	(0.022)	(0.030)	(0.007)	(0.037)
Hours of work	0.030	0.035	0.021	0.015
	(0.010)	(0.012)	(0.006)	(0.017)
Hours of overtime	0.045	0.045	0.022	0.002
	(0.016)	(0.023)	(0.007)	(0.019)
Size of HH	-0.188	0.236	-0.131	-0.087
	(0.133)	(0.166)	(0.059)	(0.141)
Number of children in HH	-0.328	-0.158	0.112	0.009
	(0.169)	(0.191)	(0.056)	(0.130)
Marital status: Single	-0.043	1.351	-0.119	-0.064
	(0.316)	(0.597)	(0.153)	(0.340)
Marital status: Other	-0.436	-0.299	-0.469	-0.494
	(0.300)	(0.418)	(0.153)	(0.354)
Amount of housework+childcare	-0.083	-0.005	-0.021	-0.004
	(0.029)	(0.035)	(0.022)	(0.048)
Age of youngest HH-member	-0.012	0.016	-0.011	-0.022
	(0.011)	(0.012)	(0.005)	(0.010)
Firmsize:<5	0.200	-33.911	0.220	-0.930
	(0.310)	(9109915.841)	(0.188)	(0.890)
Firmsize: 20-199	0.115	0.292	-0.198	-0.080
	(0.229)	(0.330)	(0.114)	(0.421)
Firmsize: 200-2.000	0.265	0.689	-0.392	-0.162
	(0.270)	(0.362)	(0.135)	(0.436)
Firmsize:$>$ 2.000	0.489	0.927	-0.479	-0.161
	(0.291)	(0.367)	(0.145)	(0.456)
Branch: Agriculture and fishing	2.640		-0.244	-1.231
	(1.401)		(0.573)	(1.420)
Branch: Energy and water supply	-0.986		0.285	0.120
	(1.087)		(0.352)	(0.883)
Branch: Construction	1.133		0.377	-1.184
	(0.815)		(0.160)	(1.157)
Branch: Wholesale, hotel and restaurant industry	-0.128	34.614	0.230	1.255
	(0.318)	(13144367.903)	(0.122)	(1.310)
Branch: Transportation and information	-0.817	32.799	-0.187	0.588
	(0.598)	(17770789.131)	(0.252)	(0.897)
Branch: Financial intermediate	-0.105	1.285	-0.354	-0.125

Table A.2 – *Continued from previous page*

	(0.590)	(.)	(0.312)	(1.058)
Branch: Real estate, law counseling	0.281	-0.448	-0.323	-0.083
	(0.370)	(1.288)	(0.164)	(0.962)
Branch: Public Administration	0.476	0.388	-0.302	0.153
	(0.402)	(1.178)	(0.317)	(0.819)
Branch: Public and private Services	-0.047	-0.128	0.429	0.441
	(0.413)	(1.274)	(0.210)	(0.837)
Psychological strain of occupation	0.042	-0.161	0.055	-0.074
	(0.038)	(0.063)	(0.018)	(0.045)
Physical strain of occupation	-0.125	0.162	-0.078	-0.015
	(0.058)	(0.101)	(0.020)	(0.056)
Great Worries about job security	-0.390	-0.099	-0.038	0.185
	(0.181)	(0.224)	(0.091)	(0.244)
Great Worries about own economic situation	0.379	0.115	-0.132	0.041
	(0.157)	(0.187)	(0.088)	(0.215)
Satisfaction with work	0.091	-0.067	0.097	0.047
	(0.031)	(0.043)	(0.017)	(0.042)
Observations	3129	1989	11671	2294
Individuals	493	306	1365	298

Note: Standard errors in parentheses.

Table A.3.: The Effects of Subjective Health on Job Status - Mediated by Knowledge Intensity

	(1) W - Private	(2) M - Private
Subjective Health	-0.197	-0.040
	(0.199)	(0.134)
log. Knowledge intensity	0.100	0.437
	(0.195)	(0.143)
Interaction effect	-0.373	-0.057
	(0.163)	(0.128)
Age	0.443	0.381
	(0.107)	(0.107)
Age^2	-0.006	-0.005
	(0.001)	(0.001)
East Germany	0.572	-1.093
	(0.757)	(0.500)
Years of Education	0.020	0.185
	(0.111)	(0.078)
Years of FT experience	0.031	-0.007
	(0.043)	(0.088)
log. Wage per Hour	0.143	0.437
	(0.182)	(0.149)
Job tenure	0.083	0.030
	(0.021)	(0.010)
Hours of work	0.029	0.014
	(0.009)	(0.008)
Hours of overtime	0.045	0.010
	(0.016)	(0.009)
Size of HH	-0.144	-0.126
	(0.129)	(0.088)
Number of children in HH	-0.330	-0.031
	(0.166)	(0.086)
Marital status: Single	-0.054	-0.220
	(0.298)	(0.224)
Marital status: Other	-0.123	-0.327
	(0.283)	(0.223)
Amount of housework+childcare	-0.086	-0.058
	(0.028)	(0.027)
Age of youngest HH-member	-0.010	-0.018
	(0.011)	(0.007)
Firmsize:< 5	0.244	0.370
	(0.298)	(0.245)
Firmsize: 20-199	0.212	-0.070
	(0.225)	(0.159)
Firmsize: 200-2.000	0.339	-0.270
	(0.264)	(0.184)
Firmsize:> 2.000	0.632	-0.306
	(0.289)	(0.201)
Branch: Agriculture and fishing	14.821	-1.549
	(721.234)	(0.997)
Branch: Energy and water supply	-0.532	0.195

Table A.3 – *Continued from previous page*

	(0.967)	(0.455)
Branch: Construction	0.629	0.205
	(0.754)	(0.230)
Branch: Wholesale, hotel and restaurant industry	-0.022	0.209
	(0.312)	(0.171)
Branch: Transportation and information	-0.626	0.041
	(0.578)	(0.315)
Branch: Financial intermediate	-0.093	-0.582
	(0.583)	(0.424)
Branch: Real estate, law counseling	0.325	-0.264
	(0.360)	(0.220)
Branch: Public Administration	0.615	0.180
	(0.401)	(0.422)
Branch: Public and private Services	0.113	0.171
	(0.394)	(0.258)
Psychological strain of occupation	0.052	0.025
	(0.038)	(0.025)
Physical strain of occupation	-0.089	-0.042
	(0.061)	(0.030)
Great Worries about job security	-0.318	-0.234
	(0.174)	(0.116)
Great Worries about own economic situation	0.394	0.056
	(0.155)	(0.110)
Satisfaction with work	0.079	0.078
	(0.031)	(0.023)
Observations	3288	6537
Individuals	510	931

Note: Standard errors in parentheses.

Table A.4.: The Effects of log. Days of Sickness Absence on Job Status - Mediated by Knowledge Intensity

	(1) W - Private	(2) M - Private
log. Days of sickness absence	-0.129	-0.052
	(0.079)	(0.049)
log. Knowledge intensity	0.503	0.430
	(0.172)	(0.114)
Interaction effect	-0.098	0.016
	(0.064)	(0.045)
Age	0.203	0.405
	(0.072)	(0.066)
Age^2	-0.003	-0.005
	(0.001)	(0.000)
East Germany	1.587	-0.397
	(0.619)	(0.372)
Years of Education	0.106	0.141
	(0.070)	(0.048)
Years of FT experience	0.074	0.028
	(0.026)	(0.050)
log. Wage per Hour	0.469	0.507
	(0.147)	(0.103)
Job tenure	0.051	0.032
	(0.014)	(0.007)
Hours of work	0.043	0.020
	(0.007)	(0.006)
Hours of overtime	0.055	0.022
	(0.012)	(0.007)
Size of HH	-0.200	-0.117
	(0.098)	(0.060)
Number of children in HH	-0.009	0.078
	(0.114)	(0.057)
Marital status: Single	0.125	-0.140
	(0.224)	(0.154)
Marital status: Other	-0.306	-0.467
	(0.232)	(0.154)
Amount of housework+childcare	-0.067	-0.023
	(0.023)	(0.022)
Age of youngest HH-member	-0.013	-0.011
	(0.008)	(0.005)
Firmsize:< 5	-0.000	0.232
	(0.225)	(0.190)
Firmsize: 20-199	0.046	-0.140

Table A.4 – *Continued from previous page*

	(0.168)	(0.116)
Firmsize: 200-2.000	-0.010	-0.334
	(0.202)	(0.136)
Firmsize:> 2.000	0.285	-0.411
	(0.216)	(0.147)
Branch: Agriculture and fishing	2.716	-0.647
	(1.389)	(0.840)
Branch: Energy and water supply	-0.646	0.309
	(0.902)	(0.353)
Branch: Construction	-0.066	0.373
	(0.400)	(0.161)
Branch: Wholesale, hotel and restaurant industry	0.280	0.258
	(0.221)	(0.124)
Branch: Transportation and information	-0.510	-0.143
	(0.451)	(0.253)
Branch: Financial intermediate	0.679	-0.342
	(0.428)	(0.313)
Branch: Real estate, law counseling	0.441	-0.329
	(0.264)	(0.165)
Branch: Public Administration	0.503	-0.309
	(0.299)	(0.317)
Branch: Public and private Services	0.446	0.411
	(0.297)	(0.210)
Psychological strain of occupation	0.076	0.037
	(0.030)	(0.019)
Physical strain of occupation	-0.143	-0.035
	(0.049)	(0.022)
Great Worries about job security	-0.245	-0.036
	(0.151)	(0.092)
Great Worries about own economic situation	0.215	-0.133
	(0.129)	(0.089)
Satisfaction with work	0.100	0.097
	(0.025)	(0.017)
Observations	5188	11563
Individuals	661	1358

Note: Standard errors in parentheses.

Table A.5.: The Effects of Subjective Health on Job Status in Different Occupations - Women

	(1) Male Dominated	(2) Mixed	(3) Female Dominated
Subjective Health	-0.060	0.047	0.484
	(0.349)	(0.178)	(0.167)
Age	0.444	0.350	0.530
	(0.400)	(0.204)	(0.178)
Age^2	-0.011	-0.006	-0.004
	(0.005)	(0.002)	(0.002)
East Germany	12.280	0.734	-14.164
	(1780.158)	(1.707)	(991.360)
Years of Education	0.739	0.106	-0.557
	(0.784)	(0.193)	(0.238)
Years of FT experience	0.066	0.115	-0.004
	(0.179)	(0.086)	(0.073)
log. Wage per Hour	0.121	0.302	0.025
	(0.554)	(0.392)	(0.271)
Job tenure	0.088	0.073	0.073
	(0.071)	(0.058)	(0.035)
Hours of work	0.043	0.037	0.021
	(0.033)	(0.021)	(0.015)
Hours of overtime	-0.015	0.086	0.034
	(0.061)	(0.026)	(0.029)
Size of HH	1.206	-0.349	-0.315
	(0.635)	(0.270)	(0.220)
Number of children in HH	-0.316	-0.452	-0.150
	(0.720)	(0.282)	(0.293)
Marital status: Single	-0.455	-0.462	-0.175
	(1.019)	(0.488)	(0.582)
Marital status: Other	-0.035	-0.724	0.710
	(1.013)	(0.529)	(0.564)
Amount of housework+childcare	-0.032	-0.085	-0.084
	(0.108)	(0.049)	(0.046)
Age of youngest HH-member	0.163	-0.024	-0.025

Table A.5 – *Continued from previous page*

	(0.056)	(0.017)	(0.020)
Firmsize:< 5	4.122	-0.713	0.149
	(1.751)	(1.135)	(0.441)
Firmsize: 20-199	2.648	-0.203	0.369
	(1.307)	(0.465)	(0.373)
Firmsize: 200-2.000	1.488	0.351	1.116
	(1.786)	(0.527)	(0.531)
Firmsize:> 2.000	0.859	0.811	1.116
	(1.966)	(0.557)	(0.588)
Branch: Construction	2.507		14.811
	(1.900)		(2342.390)
Branch: Wholesale, hotel and restaurant industry	-2.486	-0.132	0.754
	(1.263)	(0.611)	(0.771)
Branch: Transportation and information	2.565	0.520	0.409
	(5.706)	(1.647)	(1.547)
Branch: Financial intermediate	10.415	-1.869	
	(1209.297)	(1.342)	
Branch: Real estate, law counseling	0.554	-0.038	1.306
	(1.611)	(0.809)	(0.855)
Branch: Public Administration	-0.193	0.721	2.180
	(1.617)	(0.898)	(0.990)
Branch: Public and private Services	3.792	-1.573	1.451
	(2.027)	(0.871)	(0.897)
Psychological strain of occupation	-0.304	0.004	0.051
	(0.234)	(0.093)	(0.121)
Physical strain of occupation	0.054	-0.018	-0.018
	(0.232)	(0.152)	(0.166)
Great Worries about job security	-0.655	-0.348	0.180
	(0.561)	(0.290)	(0.324)
Great Worries about own economic situation	0.597	0.079	0.458
	(0.504)	(0.281)	(0.241)
Satisfaction with work	0.293	0.022	0.097
	(0.117)	(0.052)	(0.055)
Observations	412	1102	1213
Individuals	96	204	226

Note: Standard errors in parentheses.

Table A.6.: The Effects of Subjective Health on Job Status in Different Occupations - Men

	(1) Male Dominated	(2) Mixed	(3) Female Dominated
Subjective Health	0.074	0.093	-0.133
	(0.096)	(0.150)	(0.312)
Age	0.375	0.529	1.542
	(0.160)	(0.219)	(0.682)
Age^2	-0.004	-0.007	-0.006
	(0.001)	(0.001)	(0.003)
East Germany	-0.556	-1.719	-14.729
	(0.766)	(1.168)	(2638.151)
Years of Education	0.151	0.166	0.337
	(0.120)	(0.155)	(0.390)
Years of FT experience	-0.017	-0.007	-0.900
	(0.137)	(0.182)	(0.577)
log. Wage per Hour	0.148	0.831	0.479
	(0.214)	(0.299)	(0.651)
Job tenure	0.042	0.030	-0.049
	(0.016)	(0.022)	(0.041)
Hours of work	0.009	0.019	0.013
	(0.011)	(0.015)	(0.035)
Hours of overtime	-0.005	0.006	-0.055
	(0.012)	(0.018)	(0.040)
Size of HH	0.049	-0.370	0.040
	(0.122)	(0.186)	(0.459)
Number of children in HH	0.038	-0.625	0.992
	(0.113)	(0.196)	(0.470)
Marital status: Single	-0.391	-0.511	1.108
	(0.334)	(0.404)	(0.820)
Marital status: Other	-0.733	0.497	-0.095
	(0.300)	(0.553)	(0.878)
Amount of housework+childcare	-0.067	-0.052	0.279
	(0.036)	(0.056)	(0.117)
Age of youngest HH-member	-0.014	-0.038	-0.028

Table A.6 – *Continued from previous page*

	(0.009)	(0.014)	(0.029)
Firmsize:< 5	0.612	-0.125	0.009
	(0.320)	(0.671)	(1.138)
Firmsize: 20-199	-0.208	0.020	0.277
	(0.219)	(0.376)	(0.738)
Firmsize: 200-2.000	-0.335	-0.394	-0.806
	(0.254)	(0.422)	(0.988)
Firmsize:> 2.000	-0.195	-0.479	-0.152
	(0.290)	(0.454)	(1.260)
Branch: Energy and water supply	-0.159	0.702	17.194
	(0.528)	(1.620)	(955.512)
Branch: Construction	0.353	-1.388	
	(0.275)	(0.925)	
Branch: Wholesale, hotel and restaurant industry	0.298	0.088	3.270
	(0.240)	(0.434)	(1.235)
Branch: Transportation and information	-0.436	0.867	16.887
	(0.467)	(0.703)	(1522.600)
Branch: Financial intermediate	-0.650	-1.055	17.351
	(0.836)	(0.819)	(1188.875)
Branch: Real estate, law counseling	-0.112	-0.171	3.372
	(0.285)	(0.705)	(1.613)
Branch: Public Administration	0.739	-0.780	
	(0.566)	(0.924)	
Branch: Public and private Services	0.694	-0.555	0.815
	(0.369)	(0.656)	(1.646)
Psychological strain of occupation	-0.026	0.168	-0.211
	(0.038)	(0.069)	(0.241)
Physical strain of occupation	-0.076	-0.299	0.320
	(0.033)	(0.096)	(0.337)
Great Worries about job security	-0.200	-0.206	-0.783
	(0.156)	(0.237)	(0.435)
Great Worries about own economic situation	0.082	0.211	-0.230
	(0.147)	(0.224)	(0.444)
Satisfaction with work	0.055	0.108	0.210
	(0.030)	(0.047)	(0.105)
Observations	3561	1686	465
Individuals	551	291	93

Note: Standard errors in parentheses.

Table A.7.: The Effects of log. Days of Sickness Absence on Job Status in Different Occupations - Women

	(1) Male Dominated	(2) Mixed	(3) Female Dominated
log. Days of sickness absence	-0.260	0.056	-0.123
	(0.154)	(0.078)	(0.071)
Age	0.389	0.373	0.456
	(0.444)	(0.210)	(0.180)
Age^2	-0.009	-0.006	-0.004
	(0.005)	(0.002)	(0.002)
East Germany	14.532	0.637	-12.963
	(2950.242)	(1.710)	(673.092)
Years of Education	0.613	0.082	-0.668
	(0.801)	(0.194)	(0.259)
Years of FT experience	0.008	0.099	0.006
	(0.182)	(0.088)	(0.074)
log. Wage per Hour	0.096	0.260	0.048
	(0.585)	(0.400)	(0.278)
Job tenure	0.072	0.078	0.061
	(0.080)	(0.061)	(0.039)
Hours of work	0.045	0.037	0.028
	(0.036)	(0.021)	(0.016)
Hours of overtime	0.002	0.091	0.030
	(0.063)	(0.027)	(0.030)
Size of HH	1.181	-0.449	-0.367
	(0.650)	(0.286)	(0.223)
Number of children in HH	0.043	-0.466	-0.136
	(0.738)	(0.285)	(0.300)
Marital status: Single	-0.104	-0.373	-0.638
	(1.139)	(0.511)	(0.644)
Marital status: Other	-0.087	-1.091	0.056
	(1.083)	(0.568)	(0.611)
Amount of housework+childcare	-0.092	-0.057	-0.108

Table A.7 – *Continued from previous page*

	(0.128)	(0.052)	(0.048)
Age of youngest HH-member	0.165	-0.028	-0.025
	(0.057)	(0.018)	(0.021)
Firmsize:< 5	4.342	-0.581	0.112
	(2.173)	(1.145)	(0.454)
Firmsize: 20-199	2.364	-0.284	0.243
	(1.317)	(0.471)	(0.384)
Firmsize: 200-2.000	1.335	0.388	0.991
	(1.715)	(0.541)	(0.536)
Firmsize:> 2.000	0.644	0.877	1.013
	(1.854)	(0.568)	(0.593)
Branch: Construction	15.704		13.620
	(893.896)		(1299.414)
Branch: Wholesale, hotel and restaurant industry	-2.427	-0.193	0.384
	(1.232)	(0.622)	(0.797)
Branch: Transportation and information	2.186	0.007	-0.167
	(5.182)	(1.681)	(1.625)
Branch: Financial intermediate	11.729	-2.076	
	(2356.387)	(1.332)	
Branch: Real estate, law counseling	0.673	-0.274	1.206
	(1.655)	(0.843)	(0.898)
Branch: Public Administration	-0.163	0.718	1.746
	(1.695)	(0.918)	(1.000)
Branch: Public and private Services	2.109	-1.489	1.052
	(2.183)	(0.880)	(0.912)
Psychological strain of occupation	-0.349	0.053	0.052
	(0.260)	(0.096)	(0.126)
Physical strain of occupation	0.164	-0.049	-0.079
	(0.239)	(0.156)	(0.174)
Great Worries about job security	-0.519	-0.579	0.187
	(0.589)	(0.311)	(0.331)
Great Worries about own economic situation	0.575	0.117	0.382
	(0.521)	(0.289)	(0.245)
Satisfaction with work	0.253	0.024	0.113
	(0.115)	(0.051)	(0.055)
Observations	387	1042	1163
Individuals	91	193	218

Note: Standard errors in parentheses.

Table A.8.: The Effects of log. Days of Sickness Absence on Job Status in Different Occupations - Men

	(1) Male Dominated	(2) Mixed	(3) Female Dominated
log. Days of sickness absence	-0.091	-0.063	-0.174
	(0.033)	(0.058)	(0.118)
Age	0.479	0.533	0.236
	(0.129)	(0.176)	(0.390)
Age^2	-0.004	-0.007	-0.003
	(0.001)	(0.001)	(0.003)
East Germany	-0.054	-1.072	-15.479
	(0.602)	(0.873)	(2343.506)
Years of Education	0.110	0.144	0.102
	(0.082)	(0.109)	(0.232)
Years of FT experience	-0.103	-0.002	0.072
	(0.110)	(0.143)	(0.297)
log. Wage per Hour	0.260	0.920	0.150
	(0.183)	(0.274)	(0.554)
Job tenure	0.047	0.018	-0.039
	(0.013)	(0.020)	(0.035)
Hours of work	0.015	0.014	-0.012
	(0.010)	(0.014)	(0.027)
Hours of overtime	0.005	0.014	-0.002
	(0.010)	(0.016)	(0.033)
Size of HH	0.067	-0.348	0.526
	(0.101)	(0.153)	(0.382)
Number of children in HH	0.066	-0.362	0.257
	(0.092)	(0.165)	(0.358)
Marital status: Single	-0.267	-0.310	0.970
	(0.262)	(0.362)	(0.667)
Marital status: Other	-0.393	-0.275	-0.525
	(0.253)	(0.427)	(0.843)
Amount of housework+childcare	-0.041	-0.071	0.245

Table A.8 – *Continued from previous page*

	(0.033)	(0.055)	(0.118)
Age of youngest HH-member	-0.011	-0.033	0.031
	(0.008)	(0.012)	(0.024)
Firmsize:< 5	0.304	0.028	2.205
	(0.269)	(0.613)	(1.148)
Firmsize: 20-199	-0.119	-0.158	-0.320
	(0.180)	(0.349)	(0.682)
Firmsize: 200-2.000	-0.528	-0.390	-0.492
	(0.214)	(0.392)	(0.908)
Firmsize:> 2.000	-0.412	-0.495	0.225
	(0.242)	(0.416)	(1.113)
Branch: Agriculture and fishing	1.739		
	(1.515)		
Branch: Energy and water supply	-0.054	0.784	18.712
	(0.469)	(1.611)	(1156.273)
Branch: Construction	0.467	-0.531	16.527
	(0.228)	(0.736)	(648.139)
Branch: Wholesale, hotel and restaurant industry	0.328	0.099	3.811
	(0.207)	(0.358)	(1.047)
Branch: Transportation and information	-0.387	0.841	16.902
	(0.426)	(0.605)	(1465.035)
Branch: Financial intermediate	-0.085	-0.948	16.736
	(0.713)	(0.675)	(939.074)
Branch: Real estate, law counseling	-0.018	-0.637	2.969
	(0.244)	(0.563)	(1.264)
Branch: Public Administration	0.838	-0.669	
	(0.587)	(0.720)	
Branch: Public and private Services	0.662	-0.283	3.918
	(0.331)	(0.560)	(1.363)
Psychological strain of occupation	-0.014	0.170	-0.159
	(0.033)	(0.061)	(0.183)
Physical strain of occupation	-0.058	-0.289	0.150
	(0.029)	(0.088)	(0.269)
Great Worries about job security	-0.157	-0.137	-0.752
	(0.137)	(0.222)	(0.416)
Great Worries about own economic situation	-0.014	0.136	-0.134
	(0.130)	(0.205)	(0.414)
Satisfaction with work	0.076	0.106	0.146
	(0.026)	(0.042)	(0.091)
Observations	4701	2039	564
Individuals	664	330	115

Note: Standard errors in parentheses.

Table A.9.: The Effects of Long-Term Poor Health on Job Status

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
1 year of poor health	-0.031	-0.020	-0.055	0.035
	(0.113)	(0.137)	(0.077)	(0.183)
2-3 years of poor health	-0.243	-0.070	0.045	0.054
	(0.164)	(0.191)	(0.107)	(0.249)
4+ years poor health	-0.453	0.050	-0.244	-0.267
	(0.163)	(0.188)	(0.110)	(0.251)
Age	0.313	0.256	0.457	0.566
	(0.079)	(0.103)	(0.074)	(0.157)
Age^2	-0.004	-0.003	-0.005	-0.005
	(0.001)	(0.001)	(0.000)	(0.001)
East Germany	1.271	0.374	-0.481	0.498
	(0.575)	(0.746)	(0.358)	(0.717)
Years of Education	0.131	0.163	0.112	0.151
	(0.075)	(0.089)	(0.051)	(0.091)
Years of FT experience	0.045	-0.021	-0.028	-0.146
	(0.031)	(0.032)	(0.056)	(0.092)
log. Wage per Hour	0.303	0.307	0.617	0.116
	(0.153)	(0.214)	(0.118)	(0.254)
Job tenure	0.047	-0.007	0.037	-0.036
	(0.015)	(0.024)	(0.008)	(0.042)
Hours of work	0.043	0.035	0.019	0.017
	(0.008)	(0.010)	(0.006)	(0.017)
Hours of overtime	0.056	0.049	0.021	-0.013
	(0.013)	(0.019)	(0.007)	(0.020)
Size of HH	-0.105	-0.056	-0.120	-0.303

Table A.9 – *Continued from previous page*

	(0.103)	(0.128)	(0.067)	(0.161)
Number of children in HH	-0.056	-0.201	0.108	-0.043
	(0.120)	(0.126)	(0.062)	(0.140)
Marital status: Single	-0.010	0.230	0.077	-0.265
	(0.236)	(0.407)	(0.168)	(0.376)
Marital status: Other	-0.251	-0.281	-0.445	-0.999
	(0.237)	(0.317)	(0.171)	(0.390)
Amount of housework+childcare	-0.062	0.020	-0.035	0.005
	(0.023)	(0.029)	(0.023)	(0.050)
Age of youngest HH-member	-0.006	0.004	-0.009	-0.036
	(0.008)	(0.009)	(0.005)	(0.011)
Firmsize:<5	0.146	-1.339	0.252	-0.220
	(0.235)	(0.796)	(0.196)	(0.903)
Firmsize: 20-199	0.135	0.114	-0.193	-0.168
	(0.176)	(0.243)	(0.122)	(0.438)
Firmsize: 200-2.000	0.063	0.022	-0.407	0.078
	(0.210)	(0.265)	(0.144)	(0.457)
Firmsize:>2.000	0.375	0.416	-0.495	-0.231
	(0.227)	(0.268)	(0.157)	(0.483)
Branch: Agriculture and fishing	2.219	-15.131	-0.416	-1.200
	(1.291)	(841.470)	(0.647)	(1.512)
Branch: Energy and water supply	-0.292	-14.956	0.187	0.103
	(0.844)	(841.471)	(0.369)	(1.056)
Branch: Construction	0.129	-3.619	0.400	-0.790
	(0.436)	(1130.986)	(0.174)	(1.296)
Branch: Wholesale, hotel and restaurant industry	0.343	-3.439	0.316	1.070
	(0.239)	(1119.301)	(0.130)	(1.316)
Branch: Transportation and information	-0.509	-2.848	-0.032	0.394
	(0.467)	(1139.743)	(0.260)	(1.169)
Branch: Financial intermediate	0.762	-16.173	-0.177	-0.242
	(0.465)	(841.470)	(0.332)	(1.225)
Branch: Real estate, law counseling	0.338	-17.859	-0.106	0.255
	(0.277)	(841.470)	(0.173)	(1.117)
Branch: Public Administration	0.714	-16.704	-0.098	0.071
	(0.309)	(841.470)	(0.327)	(0.985)
Branch: Public and private Services	0.480	-16.811	0.486	0.315
	(0.303)	(841.470)	(0.209)	(0.992)
Psychological strain of occupation	0.110	-0.099	0.045	-0.119
	(0.030)	(0.050)	(0.019)	(0.048)
Physical strain of occupation	-0.180	0.102	-0.077	0.016
	(0.046)	(0.077)	(0.021)	(0.058)
Great Worries about job security	-0.293	-0.120	-0.083	0.117
	(0.154)	(0.180)	(0.095)	(0.254)
Great Worries about own economic situation	0.291	0.104	-0.040	0.077
	(0.132)	(0.153)	(0.090)	(0.216)
Satisfaction with work	0.091	0.001	0.092	0.073
	(0.026)	(0.034)	(0.018)	(0.044)
Observations	4708	3150	9725	2118
Individuals	625	411	1208	281

Note: Standard errors in parentheses.

Table A.10.: The Effects of Subjective Health on Job Status - Applicants

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
Subjective Health	0.233	0.068	-0.065	0.169
	(0.103)	(0.054)	(0.081)	(0.088)
Age	0.002	-0.130	-0.040	-0.089
	(0.057)	(0.029)	(0.041)	(0.042)
Age^2	-0.000	0.001	0.000	0.001
	(0.001)	(0.000)	(0.000)	(0.001)
East Germany	-0.084	-0.059	-0.057	0.137
	(0.158)	(0.088)	(0.131)	(0.132)
Years of Education	0.254	0.056	0.242	0.040
	(0.030)	(0.021)	(0.026)	(0.029)
Years of FT experience	0.013	-0.004	0.033	-0.023
	(0.013)	(0.005)	(0.015)	(0.013)
log. Wage per Hour	0.923	-0.248	0.806	0.258
	(0.160)	(0.110)	(0.156)	(0.152)
Job tenure	0.005	0.003	0.004	-0.006
	(0.010)	(0.005)	(0.007)	(0.007)
Hours of work	0.035	0.005	0.021	-0.021
	(0.009)	(0.005)	(0.008)	(0.008)

Table A.10 – *Continued from previous page*

Hours of overtime	0.069	0.031	0.032	0.030
	(0.015)	(0.013)	(0.011)	(0.014)
Size of HH	-0.174	-0.111	-0.034	-0.045
	(0.074)	(0.050)	(0.067)	(0.067)
Number of children in HH	0.042	0.015	0.122	0.115
	(0.153)	(0.074)	(0.086)	(0.102)
Marital status: Single	0.034	-0.194	0.031	-0.153
	(0.161)	(0.119)	(0.145)	(0.168)
Marital status: Other	-0.166	-0.184	-0.168	0.238
	(0.229)	(0.142)	(0.255)	(0.195)
Amount of housework+childcare	-0.056	0.000	-0.115	0.005
	(0.035)	(0.014)	(0.039)	(0.031)
Age of youngest HH-member	-0.017	-0.002	-0.006	0.005
	(0.008)	(0.004)	(0.005)	(0.006)
Firmsize:$<$ 5	0.075	0.211	0.248	-0.052
	(0.230)	(0.200)	(0.211)	(0.289)
Firmsize: 20-199	-0.155	-0.169	-0.146	-0.275
	(0.193)	(0.105)	(0.137)	(0.181)
Firmsize: 200-2.000	0.110	-0.344	-0.154	-0.343
	(0.202)	(0.117)	(0.153)	(0.185)
Firmsize:$>$ 2.000	0.207	-0.351	-0.340	-0.328
	(0.220)	(0.123)	(0.162)	(0.188)
Branch: Agriculture and fishing	-23.518	-0.699	-0.668	-2.530
	(0.301)	(0.465)	(0.679)	(1.015)
Branch: Energy and water supply	-0.564	-0.620	0.521	-0.813
	(0.652)	(0.329)	(0.330)	(0.253)
Branch: Construction	-0.177	-0.055	0.242	-0.711
	(0.512)	(0.404)	(0.181)	(0.289)
Branch: Wholesale, hotel and restaurant industry	0.233	-0.640	0.149	-0.016
	(0.189)	(0.197)	(0.142)	(0.252)
Branch: Transportation and information	0.120	-0.783	-1.051	-0.968
	(0.275)	(0.220)	(0.266)	(0.208)
Branch: Financial intermediate	-0.226	-1.169	-0.425	-1.168
	(0.249)	(0.227)	(0.200)	(0.317)
Branch: Real estate, law counseling	0.080	-1.899	-0.044	-0.856
	(0.235)	(0.400)	(0.165)	(0.282)
Branch: Public Administration	0.426	-1.212	0.275	-1.247
	(0.196)	(0.153)	(0.228)	(0.165)
Branch: Public and private Services	0.339	-1.472	-0.349	-1.110
	(0.334)	(0.229)	(0.283)	(0.219)
Psychological strain of occupation	0.080	0.038	0.024	0.015
	(0.032)	(0.018)	(0.021)	(0.020)
Physical strain of occupation	-0.133	0.012	-0.231	-0.017
	(0.045)	(0.025)	(0.024)	(0.023)
Great Worries about job security	-0.356	0.058	-0.344	0.062
	(0.200)	(0.103)	(0.150)	(0.169)
Great Worries about own economic situation	0.451	-0.021	0.186	-0.077
	(0.151)	(0.091)	(0.130)	(0.146)
Satisfaction with work	0.122	-0.049	0.044	-0.032
	(0.038)	(0.019)	(0.028)	(0.031)
Observations	16842	5376	17198	2707
Individuals				

Note: Standard errors in parentheses.

Table A.11.: The Effects of Subjective Health on Job Status - Incumbents

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
Subjective Health	-0.107	-0.309	0.033	-0.190
	(0.086)	(0.246)	(0.083)	(0.374)
Age	-0.055	-0.194	-0.072	0.002
	(0.055)	(0.155)	(0.048)	(0.303)
Age^2	0.000	0.002	0.001	-0.001
	(0.001)	(0.002)	(0.001)	(0.003)
East Germany	0.109	0.828	-0.346	-2.084
	(0.154)	(0.654)	(0.143)	(1.156)
Years of Education	-0.104	-0.054	-0.115	-0.249
	(0.030)	(0.102)	(0.023)	(0.144)
Years of FT experience	-0.009	-0.014	0.010	0.090
	(0.011)	(0.042)	(0.014)	(0.129)
log. Wage per Hour	-0.308	0.225	-0.933	-3.230
	(0.143)	(0.625)	(0.148)	(1.533)
Job tenure	0.003	-0.015	0.006	-0.093

Table A.11 – *Continued from previous page*

	(0.009)	(0.035)	(0.006)	(0.036)
Hours of work	-0.011	-0.019	-0.024	-0.054
	(0.008)	(0.039)	(0.008)	(0.038)
Hours of overtime	-0.055	-0.249	-0.055	-0.120
	(0.023)	(0.068)	(0.014)	(0.056)
Size of HH	0.115	-0.185	0.102	0.569
	(0.110)	(0.343)	(0.087)	(0.301)
Number of children in HH	-0.251	0.302	-0.061	-0.191
	(0.159)	(0.494)	(0.088)	(0.464)
Marital status: Single	-0.473	0.303	0.182	1.094
	(0.176)	(0.644)	(0.158)	(0.693)
Marital status: Other	-0.216	0.702	-0.216	0.725
	(0.250)	(0.836)	(0.269)	(0.768)
Amount of housework+childcare	0.068	-0.159	0.029	-0.294
	(0.023)	(0.212)	(0.037)	(0.252)
Age of youngest HH-member	0.018	-0.022	0.010	-0.004
	(0.008)	(0.026)	(0.006)	(0.028)
Firmsize:<5	0.073	-24.532	-1.005	-24.014
	(0.209)	(2.304)	(0.329)	(1.672)
Firmsize: 20-199	0.205	-0.769	-0.192	-0.587
	(0.164)	(0.797)	(0.169)	(1.083)
Firmsize: 200-2.000	0.094	-1.379	0.087	-1.695
	(0.201)	(0.898)	(0.177)	(1.269)
Firmsize:>2.000	-0.064	-1.440	-0.230	-0.325
	(0.205)	(1.210)	(0.193)	(1.333)
Branch: Agriculture and fishing	-0.592		0.549	
	(0.815)		(0.554)	
Branch: Energy and water supply	0.685	24.284	0.469	0.116
	(1.061)	(1.119)	(0.338)	(1.023)
Branch: Construction	-0.529		-0.217	-6.478
	(0.502)		(0.229)	(2.266)
Branch: Wholesale, hotel and restaurant industry	0.411	21.947	0.024	-22.056
	(0.233)	(1.607)	(0.182)	(1.823)
Branch: Transportation and information	0.630	-0.950	0.304	-25.952
	(0.314)	(1.395)	(0.253)	(1.417)
Branch: Financial intermediate	0.732	27.386	0.475	1.077
	(0.255)	(.)	(0.213)	(1.223)
Branch: Real estate, law counseling	-0.101	27.347	0.269	-0.761
	(0.272)	(1.399)	(0.160)	(1.465)
Branch: Public Administration	0.420	23.697	0.315	-1.366
	(0.235)	(1.140)	(0.213)	(0.936)
Branch: Public and private Services	0.521	23.826	0.657	-0.153
	(0.305)	(1.236)	(0.200)	(0.922)
Psychological strain of occupation	0.034	0.019	-0.003	-0.017
	(0.028)	(0.111)	(0.024)	(0.114)
Physical strain of occupation	0.029	0.021	0.083	-0.028
	(0.043)	(0.171)	(0.025)	(0.102)
Great Worries about job security	0.279	1.201	0.132	-0.228
	(0.201)	(0.818)	(0.188)	(1.008)
Great Worries about own economic situation	0.087	1.860	-0.005	-0.452
	(0.179)	(0.498)	(0.196)	(0.909)
Satisfaction with work	-0.075	-0.144	-0.046	0.182
	(0.037)	(0.118)	(0.030)	(0.131)
Observations	1013	209	4924	301
Individuals				

Note: Standard errors in parentheses.

Table A.12.: The Effects of log. Days of Sickness Absence on Job Status - Applicants

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
log. Days of sickness absence	0.037	0.011	-0.062	0.012
	(0.041)	(0.023)	(0.031)	(0.032)
Age	0.012	-0.145	-0.000	-0.076
	(0.046)	(0.025)	(0.034)	(0.035)
Age^2	-0.000	0.001	-0.000	0.001
	(0.001)	(0.000)	(0.000)	(0.000)
East Germany	-0.076	-0.146	-0.027	0.132
	(0.136)	(0.078)	(0.108)	(0.109)
Years of Education	0.247	0.061	0.221	0.078
	(0.024)	(0.017)	(0.020)	(0.025)
Years of FT experience	0.008	0.004	0.017	-0.019
	(0.011)	(0.005)	(0.012)	(0.011)

Table A.12 – *Continued from previous page*

log. Wage per Hour	0.722	-0.224	0.887	0.147
	(0.119)	(0.097)	(0.083)	(0.119)
Job tenure	0.013	0.003	0.004	0.000
	(0.008)	(0.005)	(0.006)	(0.006)
Hours of work	0.027	-0.001	0.017	-0.014
	(0.008)	(0.004)	(0.006)	(0.007)
Hours of overtime	0.049	0.021	0.040	0.028
	(0.015)	(0.012)	(0.009)	(0.011)
Size of HH	-0.101	-0.109	-0.018	-0.015
	(0.064)	(0.044)	(0.046)	(0.053)
Number of children in HH	0.077	0.086	0.082	0.094
	(0.113)	(0.060)	(0.066)	(0.068)
Marital status: Single	0.059	-0.415	0.065	-0.106
	(0.133)	(0.097)	(0.113)	(0.133)
Marital status: Other	-0.031	-0.154	-0.077	0.021
	(0.189)	(0.120)	(0.195)	(0.170)
Amount of housework+childcare	-0.055	0.002	-0.051	-0.007
	(0.027)	(0.012)	(0.028)	(0.027)
Age of youngest HH-member	-0.011	0.003	-0.004	0.005
	(0.007)	(0.004)	(0.004)	(0.004)
Firmsize:$<$ 5	-0.020	-0.010	0.230	-0.053
	(0.195)	(0.159)	(0.172)	(0.260)
Firmsize: 20-199	-0.148	-0.236	-0.259	-0.287
	(0.155)	(0.088)	(0.109)	(0.147)
Firmsize: 200-2.000	0.129	-0.482	-0.317	-0.472
	(0.162)	(0.097)	(0.124)	(0.153)
Firmsize:$>$ 2.000	0.163	-0.447	-0.435	-0.416
	(0.179)	(0.101)	(0.128)	(0.153)
Branch: Agriculture and fishing	-0.937	-0.675	-0.191	-2.829
	(0.982)	(0.378)	(0.443)	(1.019)
Branch: Energy and water supply	-0.344	-0.554	0.486	-1.052
	(0.674)	(0.271)	(0.255)	(0.204)
Branch: Construction	-0.065	-0.101	0.374	-0.893
	(0.377)	(0.478)	(0.136)	(0.228)
Branch: Wholesale, hotel and restaurant industry	0.454	-0.511	0.189	-0.085
	(0.151)	(0.184)	(0.116)	(0.210)
Branch: Transportation and information	0.211	-0.607	-0.698	-0.909
	(0.251)	(0.184)	(0.201)	(0.141)
Branch: Financial intermediate	-0.099	-1.049	-0.269	-1.209
	(0.219)	(0.201)	(0.162)	(0.236)
Branch: Real estate, law counseling	0.185	-1.352	-0.137	-0.955
	(0.197)	(0.320)	(0.146)	(0.256)
Branch: Public Administration	0.537	-1.152	0.069	-1.327
	(0.163)	(0.145)	(0.206)	(0.129)
Branch: Public and private Services	0.108	-1.210	-0.098	-1.326
	(0.300)	(0.193)	(0.236)	(0.184)
Psychological strain of occupation	0.053	0.026	0.018	0.007
	(0.026)	(0.014)	(0.017)	(0.015)
Physical strain of occupation	-0.135	0.009	-0.225	-0.018
	(0.036)	(0.020)	(0.018)	(0.018)
Great Worries about job security	-0.329	-0.034	-0.215	-0.016
	(0.169)	(0.091)	(0.124)	(0.138)
Great Worries about own economic situation	0.202	-0.001	0.037	-0.019
	(0.132)	(0.079)	(0.109)	(0.117)
Satisfaction with work	0.131	-0.050	0.062	-0.027
	(0.031)	(0.015)	(0.021)	(0.021)
Observations	24834	8630	30153	4567
Individuals				

Note: Standard errors in parentheses.

Table A.13.: The Effects of log. Days of Sickness Absence on Job Status - Incumbents

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
log. Days of sickness absence	0.065	0.107	0.024	-0.025
	(0.044)	(0.126)	(0.040)	(0.197)
Age	-0.026	-0.120	-0.050	-0.013
	(0.051)	(0.138)	(0.044)	(0.257)
Age^2	0.000	0.001	0.001	-0.001
	(0.001)	(0.002)	(0.000)	(0.003)
East Germany	-0.026	0.437	-0.300	-1.634
	(0.153)	(0.634)	(0.124)	(0.722)
Years of Education	-0.095	-0.092	-0.085	-0.125

Table A.13 – *Continued from previous page*

	(0.026)	(0.075)	(0.020)	(0.121)
Years of FT experience	-0.008	0.010	0.013	0.129
	(0.009)	(0.028)	(0.012)	(0.097)
log. Wage per Hour	-0.453	0.222	-0.948	-2.505
	(0.148)	(0.689)	(0.124)	(0.905)
Job tenure	0.008	-0.001	0.010	-0.103
	(0.008)	(0.025)	(0.005)	(0.029)
Hours of work	-0.016	-0.030	-0.024	-0.056
	(0.007)	(0.029)	(0.007)	(0.033)
Hours of overtime	-0.045	-0.166	-0.042	-0.114
	(0.019)	(0.060)	(0.011)	(0.052)
Size of HH	0.050	-0.039	0.059	0.322
	(0.096)	(0.231)	(0.077)	(0.317)
Number of children in HH	-0.250	-0.115	-0.028	-0.053
	(0.141)	(0.321)	(0.075)	(0.413)
Marital status: Single	-0.276	0.305	0.126	1.191
	(0.165)	(0.547)	(0.139)	(0.711)
Marital status: Other	-0.201	0.282	-0.049	0.961
	(0.253)	(0.752)	(0.225)	(0.668)
Amount of housework+childcare	0.015	-0.103	0.031	-0.196
	(0.029)	(0.117)	(0.034)	(0.179)
Age of youngest HH-member	0.008	-0.026	0.007	-0.000
	(0.007)	(0.022)	(0.005)	(0.023)
Firmsize:<5	0.109	-1.903	-0.940	-2.881
	(0.204)	(1.058)	(0.292)	(1.240)
Firmsize: 20-199	0.168	-0.763	-0.149	-0.552
	(0.148)	(0.647)	(0.136)	(0.849)
Firmsize: 200-2.000	0.001	-1.707	0.012	-1.759
	(0.186)	(0.714)	(0.149)	(1.138)
Firmsize:>2.000	-0.084	-1.864	-0.262	-0.383
	(0.184)	(0.886)	(0.159)	(1.167)
Branch: Agriculture and fishing	-1.231		0.236	-24.830
	(0.537)		(0.394)	(1.672)
Branch: Energy and water supply	0.086	23.272	0.397	-0.553
	(1.015)	(1.360)	(0.317)	(1.074)
Branch: Construction	-0.834		-0.187	-4.194
	(0.508)		(0.186)	(1.086)
Branch: Wholesale, hotel and restaurant industry	0.272	21.430	0.204	1.619
	(0.210)	(1.395)	(0.148)	(1.092)
Branch: Transportation and information	0.664	-1.773	0.427	-0.227
	(0.288)	(1.313)	(0.224)	(0.972)
Branch: Financial intermediate	0.744	26.156	0.585	0.596
	(0.223)	(1.259)	(0.174)	(1.033)
Branch: Real estate, law counseling	-0.153	25.779	0.217	-0.367
	(0.245)	(.)	(0.146)	(1.182)
Branch: Public Administration	0.402	23.015	0.404	-1.645
	(0.204)	(0.987)	(0.194)	(0.884)
Branch: Public and private Services	0.476	22.917	0.781	-0.705
	(0.261)	(1.242)	(0.169)	(0.994)
Psychological strain of occupation	0.030	0.079	-0.009	0.055
	(0.027)	(0.098)	(0.019)	(0.083)
Physical strain of occupation	0.016	-0.070	0.074	0.130
	(0.040)	(0.143)	(0.021)	(0.100)
Great Worries about job security	0.284	0.744	0.056	-0.849
	(0.182)	(0.560)	(0.156)	(0.904)
Great Worries about own economic situation	0.112	2.018	-0.032	0.092
	(0.180)	(0.396)	(0.161)	(0.774)
Satisfaction with work	-0.038	-0.259	-0.052	0.157
	(0.032)	(0.101)	(0.024)	(0.103)
Observations	1269	290	6569	430
Individuals				

Note: Standard errors in parentheses.

Table A.14.: Cross-Lagged Panel Model - Cross-Sectional

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
Subjective Health at t+1				
High Status Job at t	0.014	0.006	0.006	0.002
	(0.014)	(0.018)	(0.010)	(0.019)
Subjective Health at t	0.580	0.603	0.604	0.610
	(0.008)	(0.012)	(0.007)	(0.015)
Years of Education	0.008	0.008	0.009	0.010

Table A.14 – *Continued from previous page*

	(0.002)	(0.003)	(0.002)	(0.004)
Years of FT experience	-0.000	0.001	0.002	0.001
	(0.001)	(0.001)	(0.001)	(0.002)
log. Wage per Hour	0.020	0.047	0.024	0.046
	(0.010)	(0.017)	(0.009)	(0.020)
Job tenure	0.001	-0.000	0.001	0.001
	(0.001)	(0.001)	(0.000)	(0.001)
Size of HH	0.017	-0.002	0.010	0.017
	(0.005)	(0.008)	(0.004)	(0.009)
Number of children in HH	0.005	-0.001	0.009	-0.010
	(0.007)	(0.010)	(0.005)	(0.011)
Marital status: Single	-0.002	0.009	0.025	-0.008
	(0.013)	(0.021)	(0.010)	(0.023)
Marital status: Other	0.032	-0.036	-0.002	-0.014
	(0.011)	(0.018)	(0.012)	(0.025)
Amount of housework+childcare	-0.004	-0.005	0.004	0.007
	(0.001)	(0.002)	(0.002)	(0.005)
Age of youngest HH-member	0.000	-0.001	0.001	0.002
	(0.000)	(0.001)	(0.000)	(0.001)
Firmsize:<5	-0.003	-0.032	0.026	0.005
	(0.012)	(0.042)	(0.016)	(0.062)
Firmsize: 20-199	-0.014	-0.009	0.012	0.013
	(0.010)	(0.018)	(0.010)	(0.030)
Firmsize: 200-2.000	-0.041	-0.007	0.013	0.024
	(0.012)	(0.020)	(0.011)	(0.031)
Firmsize:$>$ 2.000	-0.019	-0.025	0.008	0.006
	(0.013)	(0.020)	(0.011)	(0.031)
Branch: Agriculture and fishing	-0.001	0.081	-0.004	-0.018
	(0.042)	(0.114)	(0.028)	(0.069)
Branch: Energy and water supply	0.059	-0.148	0.015	-0.027
	(0.035)	(0.112)	(0.025)	(0.053)
Branch: Construction	0.034	0.084	0.020	0.037
	(0.023)	(0.104)	(0.011)	(0.056)
Branch: Wholesale, hotel and restaurant industry	-0.011	-0.043	0.011	0.063
	(0.011)	(0.092)	(0.010)	(0.075)
Branch: Transportation and information	0.003	-0.006	0.018	0.031
	(0.022)	(0.087)	(0.013)	(0.043)
Branch: Financial intermediate	-0.021	-0.015	0.022	0.021
	(0.020)	(0.087)	(0.017)	(0.049)
Branch: Real estate, law counseling	-0.025	-0.028	0.029	0.015
	(0.014)	(0.088)	(0.013)	(0.049)
Branch: Public Administration	-0.026	-0.037	-0.008	0.017
	(0.013)	(0.082)	(0.017)	(0.040)
Branch: Public and private Services	-0.024	-0.032	0.018	0.043
	(0.017)	(0.085)	(0.020)	(0.043)
Psychological strain of occupation	-0.005	-0.000	0.003	-0.002
	(0.002)	(0.003)	(0.001)	(0.003)
Physical strain of occupation	-0.000	-0.002	-0.002	0.001
	(0.002)	(0.004)	(0.002)	(0.003)
Hours of work	-0.001	-0.001	-0.000	0.000
	(0.000)	(0.001)	(0.001)	(0.001)
Hours of overtime	-0.004	-0.001	-0.002	-0.002
	(0.001)	(0.002)	(0.001)	(0.002)
Great Worries about job security	-0.040	-0.048	-0.020	-0.018
	(0.011)	(0.018)	(0.009)	(0.026)
Great Worries about own economic situation	-0.063	-0.061	-0.037	-0.085
	(0.010)	(0.016)	(0.009)	(0.021)
Satisfaction with work	0.016	0.017	0.018	0.021
	(0.002)	(0.003)	(0.002)	(0.004)
Age	-0.008	-0.004	-0.015	-0.012
	(0.003)	(0.005)	(0.003)	(0.006)
Age^2	0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
East Germany	0.009	-0.023	-0.003	0.015
	(0.010)	(0.014)	(0.008)	(0.016)
Constant	0.080	0.013	0.086	-0.121
	(0.078)	(0.150)	(0.066)	(0.161)
High Status Job at t+1				
High Status Job at t	0.656	0.630	0.641	0.662
	(0.013)	(0.017)	(0.010)	(0.020)
Subjective Health at t	0.005	-0.001	-0.002	0.002
	(0.002)	(0.004)	(0.003)	(0.006)
Years of Education	0.018	0.026	0.020	0.026
	(0.001)	(0.002)	(0.001)	(0.003)
Years of FT experience	0.000	-0.000	-0.002	-0.002
	(0.000)	(0.000)	(0.001)	(0.001)

Table A.14 – *Continued from previous page*

log. Wage per Hour	0.034	0.048	0.091	0.053
	(0.004)	(0.008)	(0.005)	(0.012)
Job tenure	0.000	0.000	-0.000	0.001
	(0.000)	(0.000)	(0.000)	(0.000)
Size of HH	-0.003	0.005	0.001	-0.000
	(0.002)	(0.004)	(0.002)	(0.005)
Number of children in HH	0.006	0.008	0.003	0.011
	(0.002)	(0.005)	(0.002)	(0.006)
Marital status: Single	-0.002	0.021	-0.003	-0.007
	(0.005)	(0.010)	(0.005)	(0.012)
Marital status: Other	-0.005	0.003	-0.011	0.010
	(0.004)	(0.008)	(0.005)	(0.011)
Amount of housework+childcare	-0.001	-0.002	-0.003	-0.005
	(0.000)	(0.001)	(0.001)	(0.002)
Age of youngest HH-member	-0.000	0.001	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Firmsize:$<$ 5	0.005	-0.010	0.014	-0.018
	(0.004)	(0.017)	(0.007)	(0.031)
Firmsize: 20-199	-0.000	0.000	-0.003	0.011
	(0.004)	(0.009)	(0.004)	(0.015)
Firmsize: 200-2.000	-0.002	-0.009	-0.015	0.003
	(0.005)	(0.009)	(0.005)	(0.015)
Firmsize:$>$ 2.000	0.003	-0.001	-0.011	-0.002
	(0.005)	(0.010)	(0.005)	(0.015)
Branch: Agriculture and fishing	0.010	-0.036	0.031	-0.022
	(0.011)	(0.030)	(0.012)	(0.022)
Branch: Energy and water supply	0.020	-0.059	0.019	-0.014
	(0.032)	(0.033)	(0.015)	(0.022)
Branch: Construction	0.022	-0.006	0.028	-0.007
	(0.011)	(0.067)	(0.005)	(0.022)
Branch: Wholesale, hotel and restaurant industry	0.007	-0.032	0.004	0.064
	(0.004)	(0.027)	(0.005)	(0.047)
Branch: Transportation and information	-0.007	-0.034	-0.030	-0.024
	(0.008)	(0.029)	(0.006)	(0.019)
Branch: Financial intermediate	-0.006	-0.070	-0.031	-0.049
	(0.008)	(0.024)	(0.010)	(0.026)
Branch: Real estate, law counseling	0.006	-0.061	-0.005	0.024
	(0.005)	(0.029)	(0.007)	(0.025)
Branch: Public Administration	0.007	-0.039	0.022	-0.005
	(0.005)	(0.022)	(0.010)	(0.018)
Branch: Public and private Services	0.027	-0.031	-0.005	-0.007
	(0.007)	(0.025)	(0.009)	(0.020)
Psychological strain of occupation	0.005	0.005	0.002	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Physical strain of occupation	-0.003	-0.005	-0.014	-0.007
	(0.001)	(0.002)	(0.001)	(0.002)
Hours of work	0.001	0.001	0.002	-0.000
	(0.000)	(0.000)	(0.000)	(0.001)
Hours of overtime	0.004	0.005	0.004	0.003
	(0.001)	(0.001)	(0.000)	(0.001)
Great Worries about job security	-0.006	0.003	-0.009	-0.015
	(0.004)	(0.008)	(0.004)	(0.011)
Great Worries about own economic situation	0.004	0.004	-0.002	-0.000
	(0.003)	(0.006)	(0.004)	(0.010)
Satisfaction with work	0.002	0.003	0.002	0.003
	(0.001)	(0.001)	(0.001)	(0.002)
Age	0.000	0.005	-0.001	-0.007
	(0.001)	(0.002)	(0.001)	(0.003)
Age^2	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
East Germany	-0.009	-0.003	0.012	0.008
	(0.004)	(0.007)	(0.004)	(0.009)
Constant	-0.332	-0.542	-0.381	-0.211
	(0.031)	(0.064)	(0.033)	(0.083)
var(e.fh)				
Constant	0.292	0.297	0.259	0.263
	(0.004)	(0.006)	(0.003)	(0.008)
var(e.fhq)				
Constant	0.041	0.060	0.061	0.067
	(0.002)	(0.003)	(0.002)	(0.004)
cov(e.fh,e.fhq)				
Constant	0.000	-0.002	0.003	0.000
	(0.001)	(0.001)	(0.001)	(0.002)
Observations	25316	11111	32351	6335
Individuals				

Note: Standard errors in parentheses.

Table A.15.: Cross-Lagged Panel Model with Fixed-Effects

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
Subjective Health at t+1				
High Status Job at t	-0.008	0.058	-0.016	-0.014
	(0.021)	(0.025)	(0.013)	(0.027)
Subjective Health at t	0.030	0.030	0.063	0.073
	(0.010)	(0.017)	(0.009)	(0.025)
Age	-0.009	-0.011	-0.025	-0.052
	(0.008)	(0.015)	(0.010)	(0.020)
Age^2	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
East Germany	-0.117	-0.104	-0.022	0.208
	(0.077)	(0.070)	(0.046)	(0.159)
Years of Education	0.003	-0.032	0.009	0.020
	(0.011)	(0.013)	(0.009)	(0.017)
Years of FT experience	-0.002	0.001	0.010	0.016
	(0.003)	(0.005)	(0.009)	(0.013)
log. Wage per Hour	-0.002	0.030	0.021	0.033
	(0.013)	(0.022)	(0.015)	(0.035)
Job tenure	-0.003	0.001	-0.002	-0.006
	(0.002)	(0.004)	(0.001)	(0.004)
Hours of overtime	-0.000	0.002	0.000	-0.003
	(0.002)	(0.002)	(0.001)	(0.003)
Hours of work	-0.003	-0.001	-0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.002)
Size of HH	0.009	-0.008	0.009	-0.003
	(0.010)	(0.017)	(0.009)	(0.020)
Number of children in HH	-0.031	-0.027	-0.015	0.020
	(0.012)	(0.016)	(0.009)	(0.019)
Marital status: Single	0.051	0.018	0.047	-0.044
	(0.032)	(0.056)	(0.024)	(0.056)
Marital status: Other	0.057	0.006	0.022	-0.041
	(0.027)	(0.042)	(0.026)	(0.056)
Amount of housework+childcare	-0.001	-0.003	0.003	0.001
	(0.002)	(0.003)	(0.002)	(0.006)
Age of youngest HH-member	0.001	0.000	-0.000	0.002
	(0.001)	(0.001)	(0.001)	(0.002)
Firmsize:$<$ 5	0.022	0.038	-0.008	0.078
	(0.020)	(0.073)	(0.024)	(0.098)
Firmsize: 20-199	-0.015	0.008	0.025	-0.003
	(0.018)	(0.033)	(0.016)	(0.056)
Firmsize: 200-2.000	-0.024	0.013	0.043	0.021
	(0.024)	(0.036)	(0.020)	(0.064)
Firmsize:$>$ 2.000	-0.009	0.009	0.047	0.014
	(0.025)	(0.038)	(0.022)	(0.065)
Branch: Agriculture and fishing	0.112	0.431	-0.094	0.218
	(0.065)	(0.556)	(0.050)	(0.150)
Branch: Energy and water supply	0.030	0.131	-0.051	0.066
	(0.104)	(0.558)	(0.060)	(0.120)
Branch: Construction	-0.038	0.404	0.060	0.193
	(0.038)	(0.552)	(0.021)	(0.147)
Branch: Wholesale, hotel and restaurant industry	-0.010	0.347	0.023	0.197
	(0.021)	(0.548)	(0.020)	(0.236)
Branch: Transportation and information	0.066	0.323	0.020	0.108
	(0.048)	(0.563)	(0.028)	(0.147)
Branch: Financial intermediate	0.082	0.420	0.074	-0.049
	(0.055)	(0.550)	(0.069)	(0.136)
Branch: Real estate, law counseling	0.003	0.355	0.049	0.190
	(0.027)	(0.544)	(0.022)	(0.121)
Branch: Public Administration	-0.056	0.329	0.030	0.085
	(0.033)	(0.546)	(0.042)	(0.107)
Branch: Public and private Services	-0.011	0.378	0.020	0.119
	(0.030)	(0.547)	(0.028)	(0.114)
Psychological strain of occupation	0.001	-0.001	0.001	-0.005
	(0.003)	(0.006)	(0.003)	(0.007)
Physical strain of occupation	-0.005	-0.004	-0.002	0.006
	(0.005)	(0.009)	(0.003)	(0.010)
Great Worries about job security	-0.013	-0.006	-0.008	0.060
	(0.013)	(0.019)	(0.009)	(0.030)
Great Worries about own economic situation	-0.015	-0.011	-0.011	-0.033
	(0.011)	(0.018)	(0.009)	(0.024)
Satisfaction with work	0.003	0.001	0.005	0.008
	(0.003)	(0.004)	(0.002)	(0.006)
Constant	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
High Status Job at t+1				
High Status Job at t	0.030	0.005	0.075	0.024

Table A.15 – *Continued from previous page*

	(0.021)	(0.027)	(0.015)	(0.033)
Subjective Health at t	0.006	0.001	-0.001	0.007
	(0.003)	(0.005)	(0.003)	(0.009)
Age	0.009	0.022	0.024	0.041
	(0.003)	(0.007)	(0.005)	(0.014)
Age^2	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
East Germany	0.010	0.028	-0.054	0.132
	(0.021)	(0.028)	(0.025)	(0.055)
Years of Education	0.007	0.010	0.012	0.018
	(0.006)	(0.010)	(0.006)	(0.012)
Years of FT experience	0.002	-0.002	-0.003	-0.020
	(0.001)	(0.002)	(0.005)	(0.011)
log. Wage per Hour	0.007	0.011	0.029	0.007
	(0.005)	(0.010)	(0.008)	(0.018)
Job tenure	0.002	0.000	0.002	-0.001
	(0.001)	(0.002)	(0.001)	(0.002)
Hours of overtime	0.002	0.003	0.001	-0.000
	(0.001)	(0.001)	(0.000)	(0.001)
Hours of work	0.001	0.002	0.001	0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Size of HH	-0.004	0.007	-0.006	-0.006
	(0.004)	(0.007)	(0.005)	(0.010)
Number of children in HH	-0.004	0.000	0.000	0.004
	(0.004)	(0.006)	(0.004)	(0.011)
Marital status: Single	0.000	0.044	-0.012	-0.025
	(0.013)	(0.029)	(0.012)	(0.034)
Marital status: Other	-0.010	-0.014	-0.013	0.007
	(0.011)	(0.017)	(0.013)	(0.020)
Amount of housework+childcare	-0.002	-0.000	-0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.002)
Age of youngest HH-member	0.000	0.001	-0.001	-0.001
	(0.000)	(0.001)	(0.000)	(0.001)
Firmsize:$<$ 5	0.006	-0.034	0.012	-0.020
	(0.006)	(0.030)	(0.011)	(0.071)
Firmsize: 20-199	0.001	0.016	-0.008	-0.006
	(0.006)	(0.017)	(0.008)	(0.025)
Firmsize: 200-2.000	0.002	0.027	-0.019	-0.009
	(0.008)	(0.018)	(0.010)	(0.027)
Firmsize:$>$ 2.000	0.014	0.042	-0.019	-0.027
	(0.010)	(0.019)	(0.011)	(0.028)
Branch: Agriculture and fishing	0.023	-0.005	-0.016	-0.033
	(0.018)	(0.025)	(0.025)	(0.069)
Branch: Energy and water supply	-0.001	0.005	0.023	0.008
	(0.053)	(0.019)	(0.043)	(0.050)
Branch: Construction	0.017	0.003	0.014	0.024
	(0.011)	(0.026)	(0.010)	(0.052)
Branch: Wholesale, hotel and restaurant industry	-0.007	0.064	0.011	0.085
	(0.006)	(0.032)	(0.011)	(0.116)
Branch: Transportation and information	-0.022	0.011	-0.005	0.028
	(0.015)	(0.039)	(0.012)	(0.062)
Branch: Financial intermediate	-0.011	0.052	-0.058	-0.097
	(0.019)	(0.046)	(0.038)	(0.114)
Branch: Real estate, law counseling	0.014	-0.065	-0.016	0.025
	(0.011)	(0.047)	(0.013)	(0.062)
Branch: Public Administration	0.008	0.009	0.009	0.017
	(0.013)	(0.016)	(0.027)	(0.051)
Branch: Public and private Services	-0.003	0.007	0.011	0.046
	(0.011)	(0.024)	(0.015)	(0.054)
Psychological strain of occupation	0.002	-0.007	0.001	-0.005
	(0.001)	(0.003)	(0.001)	(0.003)
Physical strain of occupation	-0.002	0.005	-0.006	0.001
	(0.002)	(0.004)	(0.002)	(0.003)
Great Worries about job security	-0.006	-0.002	-0.006	-0.006
	(0.004)	(0.008)	(0.004)	(0.012)
Great Worries about own economic situation	0.009	0.010	0.000	0.003
	(0.004)	(0.007)	(0.004)	(0.011)
Satisfaction with work	0.002	-0.002	0.003	0.004
	(0.001)	(0.002)	(0.001)	(0.003)
Constant	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
var(e.d_fh)				
Constant	0.163	0.165	0.150	0.148
	(0.003)	(0.004)	(0.002)	(0.006)
var(e.d_fhq)				
Constant	0.022	0.032	0.035	0.035

Table A.15 – *Continued from previous page*

	(0.001)	(0.002)	(0.001)	(0.002)
cov(e.d_fh,e.d_fhq)				
Constant	0.000	-0.000	0.001	-0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Observations	25316	11111	32351	6335
Individuals				

Note: Standard errors in parentheses.

Table A.16.: Cross-Lagged Panel Model for log. Days of Sickness Absence - Cross-Sectional

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
log. Days of sickness absence at t+1				
High Status Job at t	-0.041	-0.058	-0.105	-0.045
	(0.029)	(0.038)	(0.020)	(0.044)
log. Days of sickness absence at t	0.375	0.397	0.345	0.401
	(0.008)	(0.011)	(0.006)	(0.013)
Years of Education	-0.022	-0.025	-0.031	-0.027
	(0.004)	(0.007)	(0.004)	(0.009)
Years of FT experience	-0.002	-0.003	-0.006	-0.006
	(0.001)	(0.002)	(0.002)	(0.004)
log. Wage per Hour	0.111	0.119	0.028	-0.004
	(0.018)	(0.035)	(0.018)	(0.038)
Job tenure	-0.002	-0.002	-0.002	0.000
	(0.001)	(0.002)	(0.001)	(0.002)
Size of HH	-0.040	-0.038	0.006	-0.037
	(0.010)	(0.016)	(0.008)	(0.023)
Number of children in HH	0.020	0.023	0.012	0.032
	(0.014)	(0.020)	(0.011)	(0.023)
Marital status: Single	-0.047	-0.069	-0.031	-0.037
	(0.026)	(0.042)	(0.022)	(0.049)
Marital status: Other	0.002	0.104	0.033	0.076
	(0.024)	(0.039)	(0.025)	(0.058)
Amount of housework+childcare	0.006	0.007	0.006	0.018
	(0.003)	(0.005)	(0.004)	(0.010)
Age of youngest HH-member	-0.001	0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.002)
Firmsize:<5	-0.091	-0.200	-0.060	-0.056
	(0.023)	(0.068)	(0.033)	(0.135)
Firmsize: 20-199	0.132	0.033	0.053	0.022
	(0.021)	(0.040)	(0.020)	(0.063)
Firmsize: 200-2.000	0.229	0.122	0.136	0.133
	(0.026)	(0.041)	(0.022)	(0.064)
Firmsize:$>$ 2.000	0.253	0.189	0.122	0.112
	(0.027)	(0.042)	(0.023)	(0.065)
Branch: Agriculture and fishing	0.043	-0.043	-0.085	-0.020
	(0.088)	(0.203)	(0.060)	(0.182)
Branch: Energy and water supply	-0.213	-0.077	0.068	-0.014
	(0.104)	(0.165)	(0.059)	(0.103)
Branch: Construction	-0.036	-0.093	0.043	0.313
	(0.046)	(0.250)	(0.023)	(0.129)
Branch: Wholesale, hotel and restaurant industry	-0.041	0.214	-0.059	0.206
	(0.023)	(0.165)	(0.022)	(0.159)
Branch: Transportation and information	0.060	-0.043	-0.034	0.061
	(0.048)	(0.142)	(0.032)	(0.096)
Branch: Financial intermediate	0.051	-0.162	0.038	-0.012
	(0.041)	(0.138)	(0.037)	(0.102)
Branch: Real estate, law counseling	0.013	-0.023	0.051	0.040
	(0.029)	(0.157)	(0.026)	(0.111)
Branch: Public Administration	-0.019	0.018	-0.012	-0.019
	(0.027)	(0.129)	(0.043)	(0.087)
Branch: Public and private Services	-0.023	-0.018	-0.013	0.065
	(0.034)	(0.138)	(0.038)	(0.096)
Psychological strain of occupation	0.002	0.004	0.001	0.003
	(0.004)	(0.006)	(0.003)	(0.006)
Physical strain of occupation	0.021	0.000	0.023	0.001
	(0.005)	(0.009)	(0.003)	(0.008)
Hours of work	0.012	0.012	-0.000	0.004
	(0.001)	(0.002)	(0.001)	(0.003)
Hours of overtime	-0.007	-0.012	-0.007	-0.017
	(0.003)	(0.004)	(0.002)	(0.004)
Great Worries about job security	-0.009	0.035	-0.051	0.002
	(0.023)	(0.038)	(0.019)	(0.054)

Table A.16 – *Continued from previous page*

Great Worries about own economic situation	0.066	0.069	0.022	0.152
	(0.020)	(0.032)	(0.019)	(0.045)
Satisfaction with work	-0.043	-0.062	-0.052	-0.059
	(0.004)	(0.007)	(0.004)	(0.008)
Age	-0.018	-0.015	-0.027	-0.019
	(0.006)	(0.010)	(0.006)	(0.013)
Age^2	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
East Germany	0.035	0.018	-0.005	-0.025
	(0.023)	(0.032)	(0.019)	(0.040)
Constant	0.935	1.164	1.704	1.684
	(0.152)	(0.274)	(0.140)	(0.332)
High Status Job at t+1				
High Status Job at t	0.658	0.624	0.648	0.664
	(0.012)	(0.016)	(0.008)	(0.017)
log. Days of sickness absence at t	-0.001	-0.003	-0.004	-0.003
	(0.001)	(0.002)	(0.001)	(0.002)
Years of Education	0.016	0.026	0.019	0.025
	(0.001)	(0.002)	(0.001)	(0.002)
Years of FT experience	0.000	-0.000	-0.001	-0.002
	(0.000)	(0.000)	(0.000)	(0.001)
log. Wage per Hour	0.030	0.042	0.072	0.051
	(0.003)	(0.006)	(0.004)	(0.009)
Job tenure	0.000	0.000	-0.000	0.001
	(0.000)	(0.000)	(0.000)	(0.000)
Size of HH	-0.002	0.001	0.001	-0.004
	(0.001)	(0.003)	(0.001)	(0.004)
Number of children in HH	0.005	0.004	0.002	0.010
	(0.002)	(0.004)	(0.002)	(0.005)
Marital status: Single	-0.002	0.011	-0.006	-0.008
	(0.005)	(0.009)	(0.004)	(0.010)
Marital status: Other	-0.004	0.006	-0.010	0.004
	(0.004)	(0.007)	(0.004)	(0.009)
Amount of housework+childcare	-0.001	-0.001	-0.003	-0.005
	(0.000)	(0.001)	(0.001)	(0.002)
Age of youngest HH-member	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Firmsize:$<$ 5	0.002	-0.018	0.010	0.016
	(0.004)	(0.012)	(0.006)	(0.034)
Firmsize: 20-199	0.000	-0.002	-0.004	0.016
	(0.003)	(0.008)	(0.004)	(0.012)
Firmsize: 200-2.000	0.000	-0.009	-0.008	0.004
	(0.004)	(0.008)	(0.004)	(0.013)
Firmsize:$>$ 2.000	0.004	0.004	-0.007	0.004
	(0.004)	(0.009)	(0.004)	(0.013)
Branch: Agriculture and fishing	0.015	0.018	0.022	0.008
	(0.009)	(0.030)	(0.010)	(0.032)
Branch: Energy and water supply	0.008	-0.026	0.010	0.002
	(0.028)	(0.029)	(0.013)	(0.018)
Branch: Construction	0.021	0.039	0.023	0.018
	(0.011)	(0.046)	(0.004)	(0.023)
Branch: Wholesale, hotel and restaurant industry	0.005	-0.007	0.000	0.044
	(0.003)	(0.022)	(0.005)	(0.043)
Branch: Transportation and information	-0.012	-0.011	-0.035	-0.017
	(0.008)	(0.019)	(0.005)	(0.016)
Branch: Financial intermediate	-0.006	-0.037	-0.029	-0.022
	(0.007)	(0.017)	(0.010)	(0.023)
Branch: Real estate, law counseling	0.005	-0.037	-0.006	0.025
	(0.005)	(0.022)	(0.007)	(0.023)
Branch: Public Administration	0.003	-0.014	0.015	0.006
	(0.004)	(0.015)	(0.010)	(0.016)
Branch: Public and private Services	0.023	-0.008	-0.003	-0.005
	(0.006)	(0.017)	(0.008)	(0.018)
Psychological strain of occupation	0.005	0.005	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Physical strain of occupation	-0.003	-0.004	-0.013	-0.008
	(0.001)	(0.002)	(0.001)	(0.001)
Hours of work	0.001	0.001	0.002	-0.000
	(0.000)	(0.000)	(0.000)	(0.001)
Hours of overtime	0.004	0.004	0.003	0.003
	(0.001)	(0.001)	(0.000)	(0.001)
Great Worries about job security	-0.007	-0.003	-0.007	-0.013
	(0.003)	(0.007)	(0.003)	(0.009)
Great Worries about own economic situation	-0.000	-0.001	-0.005	0.000
	(0.003)	(0.006)	(0.003)	(0.009)
Satisfaction with work	0.002	0.003	0.002	0.001

Table A.16 – *Continued from previous page*

	(0.001)	(0.001)	(0.001)	(0.002)
Age	0.000	0.004	-0.001	-0.005
	(0.001)	(0.002)	(0.001)	(0.002)
Age^2	0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
East Germany	-0.013	0.002	0.003	0.013
	(0.004)	(0.006)	(0.004)	(0.008)
Constant	-0.295	-0.501	-0.307	-0.235
	(0.026)	(0.053)	(0.026)	(0.069)
var(e.fh)				
Constant	1.409	1.527	1.490	1.421
	(0.015)	(0.023)	(0.014)	(0.030)
var(e.fhq)				
Constant	0.038	0.056	0.058	0.063
	(0.001)	(0.002)	(0.001)	(0.003)
cov(e.fh,e.fhq)				
Constant	-0.004	-0.005	-0.004	-0.001
	(0.001)	(0.003)	(0.001)	(0.003)
Observations	31733	14400	45520	8485
Individuals				

Note: Standard errors in parentheses.

Table A.17.: Cross-Lagged Panel Model with Fixed-Effects for log. Days of Sickness Absence

	(1) W - Private	(2) W - Public	(3) M - Private	(4) M - Public
log. Days of sickness absence at t+1				
High Status Job at t	0.029	-0.024	-0.013	0.008
	(0.040)	(0.049)	(0.027)	(0.064)
log. Days of sickness absence at t	0.028	0.002	0.032	0.037
	(0.008)	(0.012)	(0.007)	(0.015)
Age	-0.062	-0.114	-0.125	-0.042
	(0.013)	(0.021)	(0.020)	(0.033)
Age^2	0.001	0.001	0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.000)
East Germany	0.131	-0.109	0.100	0.172
	(0.163)	(0.175)	(0.092)	(0.213)
Years of Education	0.031	0.003	0.004	0.023
	(0.019)	(0.028)	(0.015)	(0.028)
Years of FT experience	0.016	0.007	0.033	0.002
	(0.005)	(0.008)	(0.019)	(0.020)
log. Wage per Hour	0.107	0.179	0.056	-0.137
	(0.029)	(0.052)	(0.031)	(0.069)
Job tenure	0.011	0.015	0.012	0.011
	(0.003)	(0.007)	(0.002)	(0.008)
Hours of overtime	-0.007	-0.009	-0.007	-0.013
	(0.003)	(0.006)	(0.002)	(0.005)
Hours of work	0.013	0.013	0.001	0.006
	(0.002)	(0.003)	(0.002)	(0.005)
Size of HH	-0.062	-0.045	-0.002	-0.047
	(0.019)	(0.028)	(0.014)	(0.036)
Number of children in HH	0.031	0.032	0.018	0.065
	(0.021)	(0.029)	(0.016)	(0.038)
Marital status: Single	-0.017	-0.018	-0.113	-0.001
	(0.053)	(0.097)	(0.042)	(0.085)
Marital status: Other	-0.014	0.037	-0.063	0.164
	(0.045)	(0.074)	(0.046)	(0.103)
Amount of housework+childcare	-0.001	0.010	-0.001	0.014
	(0.004)	(0.007)	(0.005)	(0.011)
Age of youngest HH-member	-0.003	-0.002	-0.001	-0.005
	(0.002)	(0.002)	(0.001)	(0.003)
Firmsize:$<$ 5	0.013	0.156	-0.049	0.188
	(0.037)	(0.123)	(0.049)	(0.299)
Firmsize: 20-199	0.091	0.078	0.058	-0.218
	(0.034)	(0.065)	(0.031)	(0.102)
Firmsize: 200-2.000	0.153	0.114	0.114	-0.107
	(0.042)	(0.070)	(0.038)	(0.108)
Firmsize:$>$ 2.000	0.155	0.135	0.095	-0.096
	(0.048)	(0.072)	(0.042)	(0.107)
Branch: Agriculture and fishing	-0.018	-0.197	-0.185	0.163
	(0.152)	(0.233)	(0.109)	(0.391)
Branch: Energy and water supply	-0.413	-0.111	0.033	-0.036
	(0.170)	(0.329)	(0.133)	(0.327)

Table A.17 – *Continued from previous page*

Branch: Construction	0.067	-0.089	-0.028	0.333
	(0.067)	(0.333)	(0.041)	(0.344)
Branch: Wholesale, hotel and restaurant industry	0.053	0.035	-0.077	0.055
	(0.039)	(0.276)	(0.037)	(0.520)
Branch: Transportation and information	-0.004	0.187	-0.079	0.096
	(0.087)	(0.264)	(0.060)	(0.330)
Branch: Financial intermediate	0.136	-0.105	-0.128	0.300
	(0.099)	(0.288)	(0.095)	(0.403)
Branch: Real estate, law counseling	-0.019	-0.111	-0.097	0.101
	(0.051)	(0.213)	(0.047)	(0.334)
Branch: Public Administration	0.005	-0.123	-0.024	0.142
	(0.066)	(0.161)	(0.079)	(0.307)
Branch: Public and private Services	-0.167	-0.082	-0.106	0.147
	(0.061)	(0.188)	(0.058)	(0.318)
Psychological strain of occupation	-0.005	-0.001	-0.006	0.004
	(0.007)	(0.013)	(0.005)	(0.012)
Physical strain of occupation	0.000	0.003	0.008	0.008
	(0.010)	(0.021)	(0.006)	(0.017)
Great Worries about job security	-0.044	-0.017	-0.060	-0.050
	(0.026)	(0.045)	(0.022)	(0.070)
Great Worries about own economic situation	-0.007	0.028	-0.023	0.055
	(0.023)	(0.036)	(0.021)	(0.051)
Satisfaction with work	-0.029	-0.052	-0.035	-0.034
	(0.005)	(0.008)	(0.005)	(0.011)
Constant	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
High Status Job at t+1				
High Status Job at t	0.086	0.059	0.151	0.098
	(0.019)	(0.025)	(0.014)	(0.028)
log. Days of sickness absence at t	-0.000	-0.000	-0.003	0.001
	(0.001)	(0.002)	(0.001)	(0.002)
Age	0.006	0.011	0.017	0.031
	(0.002)	(0.004)	(0.004)	(0.011)
Age^2	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
East Germany	0.058	0.027	-0.018	0.063
	(0.038)	(0.044)	(0.022)	(0.030)
Years of Education	0.007	0.019	0.009	0.019
	(0.004)	(0.007)	(0.004)	(0.009)
Years of FT experience	0.002	0.000	-0.002	-0.015
	(0.001)	(0.002)	(0.004)	(0.009)
log. Wage per Hour	0.016	0.018	0.035	0.012
	(0.005)	(0.009)	(0.006)	(0.015)
Job tenure	0.001	-0.002	0.001	-0.002
	(0.001)	(0.002)	(0.001)	(0.002)
Hours of overtime	0.003	0.004	0.002	-0.000
	(0.001)	(0.001)	(0.000)	(0.001)
Hours of work	0.001	0.002	0.001	0.001
	(0.000)	(0.001)	(0.000)	(0.001)
Size of HH	-0.005	-0.001	-0.001	-0.008
	(0.003)	(0.006)	(0.002)	(0.008)
Number of children in HH	0.003	-0.012	0.003	0.008
	(0.003)	(0.008)	(0.003)	(0.009)
Marital status: Single	0.002	-0.014	-0.014	-0.009
	(0.011)	(0.021)	(0.009)	(0.023)
Marital status: Other	-0.004	-0.004	-0.015	-0.000
	(0.007)	(0.012)	(0.009)	(0.022)
Amount of housework+childcare	-0.001	0.000	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)
Age of youngest HH-member	-0.000	0.000	-0.000	-0.001
	(0.000)	(0.000)	(0.000)	(0.001)
Firmsize:$<$ 5	0.003	-0.023	0.012	-0.043
	(0.005)	(0.026)	(0.009)	(0.062)
Firmsize: 20-199	0.002	0.015	-0.005	-0.008
	(0.005)	(0.015)	(0.006)	(0.021)
Firmsize: 200-2.000	-0.001	0.015	-0.015	-0.017
	(0.006)	(0.015)	(0.007)	(0.024)
Firmsize:$>$ 2.000	0.006	0.024	-0.021	-0.021
	(0.008)	(0.016)	(0.009)	(0.024)
Branch: Agriculture and fishing	0.027	0.068	-0.006	-0.028
	(0.011)	(0.109)	(0.022)	(0.062)
Branch: Energy and water supply	-0.012	0.090	0.020	0.015
	(0.040)	(0.076)	(0.031)	(0.048)
Branch: Construction	-0.003	0.033	0.013	-0.012
	(0.012)	(0.031)	(0.008)	(0.055)
Branch: Wholesale, hotel and restaurant industry	0.002	0.008	0.012	0.063

Table A.17 – *Continued from previous page*

	(0.006)	(0.011)	(0.008)	(0.094)
Branch: Transportation and information	-0.016	0.063	-0.007	0.005
	(0.015)	(0.035)	(0.009)	(0.058)
Branch: Financial intermediate	0.030	0.071	-0.000	0.006
	(0.014)	(0.031)	(0.028)	(0.063)
Branch: Real estate, law counseling	0.021	-0.037	-0.017	0.008
	(0.010)	(0.038)	(0.012)	(0.058)
Branch: Public Administration	0.016	0.011	-0.022	0.028
	(0.012)	(0.010)	(0.020)	(0.050)
Branch: Public and private Services	0.013	0.011	0.021	0.026
	(0.010)	(0.017)	(0.013)	(0.052)
Psychological strain of occupation	0.003	-0.002	0.002	-0.004
	(0.001)	(0.003)	(0.001)	(0.003)
Physical strain of occupation	-0.006	0.005	-0.004	-0.001
	(0.002)	(0.004)	(0.002)	(0.003)
Great Worries about job security	-0.006	-0.003	-0.002	0.008
	(0.003)	(0.008)	(0.003)	(0.010)
Great Worries about own economic situation	0.004	0.004	-0.004	0.001
	(0.003)	(0.006)	(0.003)	(0.010)
Satisfaction with work	0.003	-0.001	0.003	0.001
	(0.001)	(0.001)	(0.001)	(0.002)
Constant	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
var(e.d_fh)				
Constant	0.896	0.948	1.015	0.875
	(0.013)	(0.019)	(0.012)	(0.024)
var(e.d_fhq)				
Constant	0.022	0.032	0.036	0.035
	(0.001)	(0.002)	(0.001)	(0.002)
cov(e.d_fh,e.d_fhq)				
Constant	-0.000	-0.002	-0.002	0.004
	(0.001)	(0.002)	(0.001)	(0.002)
Observations	31733	14400	45520	8485
Individuals				

Note: Standard errors in parentheses.

A.2. Strategies of Closure on the Labor Market

A.2.1. Protection Against Dismissal

Permanent contracts can be seen as a form of closure based on legal regulations (Giesecke 2006, Giesecke & Groß 2007). It is easier for employers not to continue a temporary contract than to fire a worker who holds a permanent contract. Therefore permanent workers face less competition and their position is (at least partly) closed. They need not fear job loss and they can extract a *rent* in form of higher wages and better working conditions.

Some scholars argue that permanent contracts are actually a reward in themselves for closure based on individual skill. The argument is as follows: An open-ended contract comes with much higher layoff costs due to possible severance pays and administrative costs (Aparicio 2011, 13). At the same time permanently employed workers are more productive than temporarily employed ones (Emerson 1988, Lazear 1990). Therefore it pays to sign permanent contracts for both employer and employee in some cases. They share a composite rent. In the end permanent contracts have both the characteristics of a closure mechanism and of a reward for closure.

Another way how skill can lead to informal closure of a labor market position is through the acquisition of firm-specific human capital (Parsons 1972). Firm specific human capital consists of skills and training a worker usually gets by on-the-job-training. These skills are also called

idiosyncratic skills (Williamson, Wachter & Harris 1975). This means that the human capital of employees is bound to a certain company and cannot or only to certain degree be transferred to other employers. Therefore workers who have acquired a lot of skills via on-the-job training strongly bound their employer towards them and vice versa. As the employer has already invested much into the specific human capital of the employee and other workers outside the firm cannot compete with the incumbent because they lack these skills, it would cost the employer dearly to replace the initial already trained worker with an untrained one (for an example of the calculation of such costs, see Hamermesh 1987).

A.2.2. Unionization

With regard to the effects of unions on closure a special focus should lie on the effect of collective bargaining agreements. They can on the one hand reduce the power of the employer, increase wages and improve working conditions as they shield their members from competition by non-union workers (Jacobsen, Skillman & Jacobsen 2004, 130). In this way they function as instruments of social closure as they are only valid for a specific group of workers. Wage differentials should increase between occupation/industries and between union members and non-members if collective bargaining agreements are unequally distributed (which they are). If collective bargaining is covered by law or state regulations unions can significantly increase wages for their members (and non-members through spill-over effects) (Weeden 2002, 63). It can be claimed that unions have an effect on industry wages rather than occupation wages as they are often organized around industries and cut across occupations (Weeden 2002, 64).
It can also be shown that labor mobility and turnover are reduced by unionization, which in turn reduces competition. This induces a feedback mechanism where longer tenure under unionization leads to increased company specific human capital (Elias 1994, 563).

A.2.3. Licensing and Registration

Licensing is done or demanded by the state or state empowered private organizations and often introduced with the argument that it protects consumers from incompetence or malfeasance in areas in which it is hard to assess such things and where incompetence or malfeasance may have dire consequences for consumers (e.g. their health). An official authority has to give permission to individuals to use certain (occupational) titles. With the introduction of such a mechanism several costs arise due to possible fees, the adaption of minimum standards required by the responsible authority, and the time consumed by the bureaucratic process. This restricts the supply of labor in this group or occupation as not all who are able to work in a certain occupation can cover these costs (Weeden 2002, 62). Licenses can also be voluntary. As voluntary licenses their most important contribution to closure is that they channel demand to a certain group by claiming only holders of the license or certificate can provide the product.

At the very least the license is an organized claim that a service or product bought from holders of such licenses are of quality (Weeden 2002, 66-67).

A.2.4. Monopoly and Ownership

This strategy of closure focuses on employers as actors and not as workers. This includes a certain change of perspective from worker to employer and it necessitates a link between the closure strategy of the employer and the rent generation of the employee.
Based on ownership of certain means of production like *technological rent* (Rutherford & Rutherford 2005, 407) and/or monopoly/oligopoly in certain product or service markets, firms are able to generate high profits which are far above those profits they would generate under perfect competition. These profits thus classify as a *rent* and the strategy is generally classified as *rent-seeking* (Rutherford & Rutherford 2005, 348). When employers share part of their profit with their employees in form of higher wages or other non-pecuniary forms, this is called *rent-sharing* (for a short review on the literature, see Martins 2007). Paying wages above competitive wages is called *efficiency wages* (see e.g. Akerlof & Yellen 1986) and is theorized to be used to avoid (among other things) shirking (Shapiro & Stiglitz 1984).
Rent or profit sharing reduces turnover, because wages are flexible. In hard times wages fall with profits and in good times they rise with profits. Therefore there is less incentive for employer and employee to terminate the labor contract. This results in reduced turnover rates (Azfar & Danninger 2000) and should increase employment stability and job security for workers.
Furthermore, successful companies can offer better terms for employees, therefore they get better workers. Sick workers drop out of good firms. This constitutes a selection effect which results in company specific health inequalities.
If a company produces in a closed position it can offer better working employment conditions to its employees in forms of efficiency wages. In branches or industries where there is heavy product competition or where companies are largely owned by investors who invest on a short term basis and who expect maximum share-holder-value the pressure put on the firms (Windolf 2008) will be redirected to the employees. Another important characteristic is the firm size and the total revenue which constrain companies in offering good working conditions.
Product market competition can increase respective labor market competition when product markets are deregulated or increasingly penetrated by international trade (Saint-Paul 2005, 282). Generally speaking a lower price-elasticity of demand on the product-market-sector means a lower wage-elasticity of labor demand in the respective sector which increases wages (Saint-Paul 2005, 284). Other labor market outcomes beyond wages like wage inequality, returns to education or training, managers' incentives, or discrimination vary with product market competition (Aparicio 2011, 2).
It can be concluded that processes of closure are not only important among workers, but also

among companies. Closure on the employer level can also induce closure on the employee level.

A.3. Open and Closed Positions - Segmented Labor Market Theory

A second big influence on the theory of open and closed position should be mentioned. It helps understanding the theoretical contribution Sørensen made to the field. The works of theorists of segmented labor market (SLM) theory are important points of inspiration for the theory of open and closed positions. SLM theorists often started off with empirical facts of the (US) labor market. Certain phenomena which could not be fully explained by neoclassical theory were pointed out. Among others these phenomena are (Cain 1976, 1217-1220):

1. persistence of poverty
2. persistence of income inequality
3. education and training failed to eradicate poverty
4. education and training as criteria for discrimination
5. discrimination
6. level and form of unemployment
7. monopolies, unions, protected labor markets

Driven by these problems dual-labor-market or segmented labor market theories emerged in the 1970s. They saw a division of the labor market into two parts with little mobility between them. One was characterized by stable well paid jobs with benefits and union coverage, the other by low paying, hazardous work, with little job security or benefits (Kalleberg & Sorensen 1979, 356). In the following I will give a brief description of some of the most important works from that strand of research.

Thurow's (1975) theory states that the number of jobs is technologically determined and that workers' reservation wage does not influence the number of job positions actually filled. Wages are seen as fixed, workers queuing for jobs at a given wage make up the supply side (Cain 1976, 1221-1222). Employers use screening devices to select workers according to their potential for further training (Thurow 1975, 87). The criterion of potential for further is training is important, because most skills are acquired on the job, after the end of the formal education process. This pays tribute to the fact that direct worker-to-worker training on-the-job is the cheapest way of training workers (Thurow 1975, 76,79). Thurow points out that job

competition and wage competition are not mutually exclusive and exist at the same time in reality. Based on the position in the queue workers are allocated to jobs which are paid based on characteristics of the job, not the worker (Thurow 1975, 76). In classical economic terms he formulates that "[...], the marginal product resides in the job and not in the man." (Thurow 1975, 77).

When employers do not have perfect information about their potential employees' productivity they resort to signals of productivity. About certain groups like women or blacks only less reliable information is available. Employers transfer their information disadvantage from the individual to the group level (Cain 1976, 1232-1233). Education is used as a screening device (Cain 1976, 1219).

Doeringer & Piore (1985) make one of the major contributions to the theory of open and closed positions. They use a different terminology and speak of internal labor markets. They try to explain differences in the determination of wages across different sectors in the industry. Doeringer and Piore state that the primary labor market is dominated by jobs in large firms with a high degree of unionization which are paying higher wages, have better career prospects, better working conditions and provide more job security. The secondary labor market (external) contains low paying jobs of discriminated groups with very unstable employment relations (Cain 1976, 1222). They argue that in internal labor markets hiring, promotion and layoff rules are regulated in collective bargaining agreements or management manuals. These regulations follow a generalized bureaucratic or administrative logic and less an individualized profit maximizing logic. The rigidity of these regulations is the defining moment of internal labor markets in contrast to external labor markets. They suggest that the existence of internal labor markets should be tested against a theoretically chosen set of variables which determines wages and demonstrate that the actual data indicates a different or modified set of variables as wage determining (Doeringer & Piore 1985, 5). Doeringer and Piore consider the neoclassical theory of wage determination to be the best choice for a reference theory, as it was common in segmented labor market theories:

> Nevertheless, since the time of Adam Smith, the classical, and then the neo-classical, school of labor economics has been a common target, representing the orthodoxy to be challenged. (Cain 1976, 1215)

Due to a lack of available data Doeringer an Piore propose some indicators for the rigidity of internal labor markets which are more heuristic of nature (Doeringer & Piore 1985, 6-7):

1. The time an internal labor market already exists
2. Comments from labor and management about certain rules
3. Investments in company specific human capital and on-the-job-training
4. Customs and traditions regarding wage structure, promotions, etc.

Internal labor markets are mainly generated by three factors. These are (Doeringer & Piore 1985, 13):

1. skill specificity
2. on-the-job training
3. customary law

The skill and job specificity increases the costs of employers for screening and hiring employees. The specificity is often not a choice made by the management, but more a tribute to certain job or technology demands (Doeringer & Piore 1985, 15). On-the-job training provides a major portion of skills used by both blue and white collar workers. For the latter the formal education is often just a screening device for the management (Doeringer & Piore 1985, 18). On-the-job training is usually organized very informally (Doeringer & Piore 1985, 19-20).
Labor turnover is reduced in internal labor markets, because workers value these internal labor markets, and benefits are often awarded according to length of service. In addition management faces costs of termination and of replacement which are considerably higher in internal labor markets than in external labor markets[1]. Replacement costs consist of costs for recruitment, screening, and training. Termination costs can be explicit (unemployment insurance or severance pay) or implicit (difference in benefit-payments) (Doeringer & Piore 1985, 29-30). Doeringer & Piore (1985, 43) differentiate between *open* and *closed* internal labor markets. Positions in closed internal labor markets are only filled with persons from within the same internal labor market. This can lead to a process of so called vacancy-chains through promotion ladders, where a chain of workers is sequentially promoted (see e.g. White 1970, Chase 1991). Most internal labor markets are between completely open and completely closed (Doeringer & Piore 1985, 43-45). The degree to which workers can involuntarily lose their job in an internal labor market is also an important characteristic. In contrast to external labor markets, in internal labor markets the options for layoffs for employers are reduced (Doeringer & Piore 1985, 49).

Doeringer & Piore (1985, 74-77) point out that the neoclassical view on labor market and wage determination fails to take certain facts into account which often appear in internal labor markets. These are permanency of employment, meaning contracts are unlimited and cannot be canceled at any time. Labor costs are fixed and wages cannot be reduced freely as suggested by the neoclassical theory. And wage decisions usually apply to groups and not to individuals.

[1] Where according to neoclassical theory they should be virtually non-existent.

A.4. Review of the Literature on Reporting Heterogeneity in Self-Rated Health

Crossley & Kennedy's (2002) study is widely cited, because they address the reliability of the subjective health measure in an innovative fashion. They use a kind of randomized questionnaire experiment with two measures of subjective health. In one group the question is asked before a block of specific health questions, in the control group the subjective health question is asked before and after the block with slightly different wording. They find significant differences in the distributions between the questions asked before and after the health block in the questionnaire. They argue that these differences can be attributed to measurement error, different interview forms (face-to-face vs. written questionnaire), and "learning" about (or becoming more aware of) health issues on part of the respondents by answering the specific health questions (Crossley & Kennedy 2002, 651). Bowling & Windsor (2008) also come to the conclusion that wording and order of the self-rated health item has an impact on its distribution for example by reducing ceiling and increasing optimistic bias effects by changing the highest category from "very good" to "excellent".

Lindeboom & van Doorslaer (2004) use the health utility index III (HUI3) as an objective index of health which is supposed to represent "true" health. They want to address the problem if certain groups use different thresholds in the subjective health measure given the same "true" health status. They define two possible problems, the *index-shift* and the *cut-point-shift*. The former means that a group (e.g. women) rate their health given same "true" health on average higher or lower than the other group. The relative distance between the thresholds remains the same for the groups (Lindeboom & van Doorslaer 2004, 1084). This could mean that women tend to report lower overall health than men, but the relation of a reported "good" to a reported "poor" means the same for men and women. A *cut-point-shift* on the other hand is defined as giving thresholds different meaning. They cannot be compared across groups (Lindeboom & van Doorslaer 2004, 1084). In this case, relation between the answers to the subjective health question are not the same for men and women. The difference between "good" and "poor" might be greater for men than for women given a measure of "true" health. Lindeboom & van Doorslaer (2004) come to the conclusion that in their dataset women and older people report better health and that therefore a direct comparison of the self-rated health across gender and age is not feasible.

Eriksson, Undén & Elofsson (2001) compare 3 self-rated health measures. The standard 5-point scale, a 7-point scale without specific answers to each category and a 5-point scale with a comparison to the respondent's age group. They conclude that the differences in a cross-sectional setting are small and that the measures can be seen as very similar (Eriksson, Undén & Elofsson 2001, 332).

Gunasekara, Carter & Blakely (2012) use longitudinal data to assess whether computed change in SRH or an explicit self-reported change in actual health is a better measure of change in health. They try to validate both measures using an objective health indicator, hospital visit within the last year. They conclude that self-reported change in health is a better indicator than SRH, because it is stronger associated with a hospital visit between two points of observation. A problem they do not address is that a hospital visit can influence the self-reported change in health (SRCH) item. A visit to the hospital is usually seen as an indicator that not all is/was well with one's health. So two persons who have the same change in "true" health, but one has been to the hospital and the other has not, could report different changes in health. If then SRCH is associated stronger with hospital visits than SRH this could also mean that the hospital visit influences the reporting behavior of SRCH, but not of SRH. The stronger association would then not be a measure of external reliability, but rather of measurement error caused by an unusual health treatment which signals worsening health to the respondent even if true health change is the same.
Benítez-Silva & Ni (2008) also compare SRCH and SRH. They agree with the results of Gunasekara, Carter & Blakely (2012) that SRCH is more consistent than computed changes in SRH. Vaillant & Wolff (2012) point in the comparison of computed changes of SRH and SRCH to the strong state-dependence of SRH. This could be one explanation of the better performance of SRCH which can capture smaller changes and does not suffer from a ceiling-effect. The state-dependence and inferiority of computed changes in SRH (CCSRH) to SRCH is one of the problems I need to address in my methodological approach.

Idler & Kasl (1995) show in a very important study that SRH is not only predictive of mortality, but also functional ability, meaning the way the body works in every-day life. They do not find gender differences in the predictive power (Idler & Kasl 1995, S349). Similarly Manor, Matthews & Power (2001) find that SRH is associated with longstanding (non-mortal) illnesses, and other specific health problems. A change in SRH has also been associated with new illnesses, more visits to a physician, and psychosocial factors of well-being (Rodin & McAvay 1992).

A different approach at estimating "true" health is used by Shmueli (2003). In this study confirmatory factor analysis, in particular a multiple indicator, multiple causes model (MIMIC) is used to estimate a latent health variable and to differentiate between systematic and random measurement error. The author uses the short-form-36 health questionnaire (SF-36), an index of chronic illnesses and a subjective visual health reporting variable. Deviant reporting behavior is found for age (older people rate their health as better) and gender with regard to the SF-36. In this case women understate their health. The author argues that his method is superior to most studies so far, because those studies just assume that they are estimating latent health when in fact they are using just a (supposedly) more reliable (objective) health indicator. In all these cases it is a theoretical assumption which is not tested.